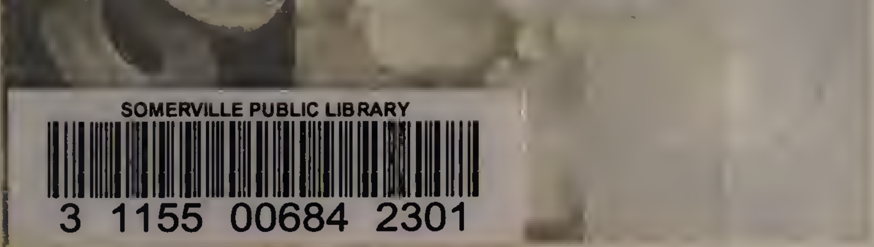

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RTN 3-23246

Phase IV Remedy Implementation Plan

50 Tufts Street, Somerville, Massachusetts

Submitted to:
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887

REF
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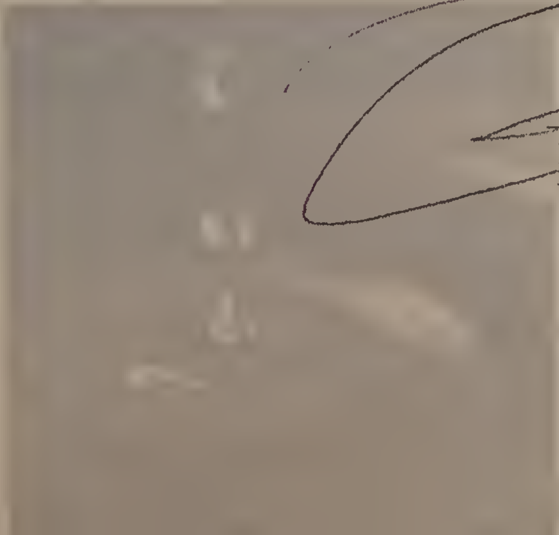
GEI

Submitted by:
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801
781-721-4000

August 10, 2009

Project 04516-3



Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

REF
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GEI

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Acronyms and Abbreviations

µg/l	micrograms per liter
AUL	Activity and Use Limitation
CEP	Critical Exposure Pathway
COPC	Compounds of Potential Concern
CRA	Comprehensive Remedial Action
CSA	Comprehensive Site Assessment
CSM	Conceptual Site Model
DEP	Massachusetts Department of Environmental Protection
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
EPEM	Exposure Pathway Elimination Measure
ft^2	square feet/foot
GEI	GEI Consultants, Inc.
HASP	Health and Safety Plan
HDPE	high density polyethylene
HP	horsepower
IH	Imminent Hazard
IRA	Immediate Response Action
lbs	pounds
LQG	Large Quantity Generator
MBTA	Massachusetts Bay Transportation Authority
MCP	Massachusetts Contingency Plan
MNA	Monitored Natural Attenuation
NOR	Notice of Responsibility
NSR	No Significant Risk
O&M	Operation and Maintenance Manuals
OHM	Oil and Hazardous Material
OMM	Operation, Maintenance and Monitoring

ORP	oxidation-reduction potential
PCE	tetrachloroethylene (perchloroethylene)
PRP	Potentially Responsible Party
PVC	polyvinyl chloride
RAA	Remedial Action Alternative
RAO	Response Action Outcome
RAP	Remedial Action Plan
RIP	Remedy Implementation Plan
RMR	Remedial Monitoring Report
ROS	Remedy Operations Status
RTN	Release Tracking Number
SQG	Small Quantity Generator
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
TCA	1,1,1-trichloroethane
TOC	total organic compounds
TCE	trichloroethylene
VOC	volatile organic compound

Executive Summary

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. (GEI) prepared this Phase IV Remedy Implementation Plan (RIP) for the site located at 50 Tufts Street in Somerville, Massachusetts (the Site) (Fig. 1). The Site is identified by Massachusetts Department of Environmental Protection (DEP) Release Tracking Number (RTN) 3-23246. The Site includes the 50 Tufts Street property (the Property), other properties in the neighborhoods east and immediately north, south and west of the Property, and the Michael E. Capuano Early Childhood Center (Capuano Center) located at 150 Glen Street in Somerville, Massachusetts (Fig. 2).

In accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0871), the purpose of this RIP is to document the requirements for the design, construction, and implementation of the Comprehensive Remedial Action (CRA) selected as a result of the Phase III evaluation by GEI dated July 14, 2008.

Conceptual Site Model

From approximately 1955 to 2002, the Property was used for storage and distribution of industrial chemicals, laundry supplies, and dry cleaning supplies. Chemicals stored at and transported to and from the Property included chlorinated solvents, which are chlorinated volatile organic compounds (VOCs). These chlorinated VOCs – particularly tetrachloroethylene (also called perchloroethylene [PCE]), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) – have been detected in soil, soil vapor, indoor air, and groundwater at the Property and are therefore the compounds of potential concern (COPCs) for the Site. PCE has also been measured in water in storm drains near the Property; however, the detection of PCE in storm drain water is being addressed under a separate RTN (3-28231).

In some buildings within the Site, chlorinated VOCs have been detected in indoor air samples. Where such detections coincide with elevated chlorinated VOC concentrations measured in soil vapor and groundwater, these lines of evidence tend to indicate a complete pathway from soil vapor into indoor air. Based on indoor air sampling and other lines of evidence, there is not a complete pathway from soil vapor into indoor air in buildings at the outer edges of the Site and in many other buildings distributed throughout the Site.

Risk Characterization

The potential exposure pathways identified in the risk characterization in the Phase II Comprehensive Site Assessment (CSA), Method 3 Risk Characterization, and Phase III

Remedial Action Plan (RAP) Report for the Site dated July 14, 2008, which require elimination or mitigation, if feasible, include:

- Inhalation of indoor air by current and potential future occupants of residential or school buildings.
- Inhalation of indoor air by current and potential future occupants of commercial buildings at concentrations above No Significant Risk (NSR).

Engineering Design

The CRA in the RAP includes existing exposure pathway elimination measures (EPEMs) at the Site and the sub-slab depressurization system/soil vapor extraction (SSDS/SVE) system at the Property, which were previously designed, approved by DEP, and installed as part of Immediate Response Actions (IRA) (properties with existing remedial systems are shown in Fig. 3). Activity and Use Limitations (AULs) and Monitored Natural Attenuation (MNA), two components of the CRA for the Site, do not require engineering design and construction activities. Therefore, many of the required elements of a RIP, such as conceptual plans, waste management procedures, and design features to control accidental releases, are not applicable to the MNA and AUL components of the CRA.

The Phase III RAP proposed the following remedial actions:

- Install EPEMs (e.g. vapor barrier and venting system, or SSDSs) and record AULs for properties where chlorinated VOCs were detected in the occupied space of a residence or school (i.e. a Critical Exposure Pathway [CEP]) or concentrations of chlorinated VOCs measured in occupied commercial buildings exceeded those constituting a condition of NSR.
- Continue the operation of the SVE system at the Property to remove contaminants from the vadose zone.
- Conduct a Site-wide MNA program to evaluate the attenuation processes in the downgradient plume and estimate the time required to achieve remedial objectives.

50 Tufts Street Property

The remedial system at the Property is a combined SSDS and SVE system with off-gas treatment. The SSDS began operating in April 2007, and the SVE system began operating in August 2007. As part of the SSDS installation, the building slab was sealed with epoxy to minimize vapor transmission through the slab. The objectives of the combined SSDS/SVE system have been achieved, and include:

- Eliminating or mitigating, to the extent feasible, the soil vapor exposure pathway to indoor air.
- Achieving a condition of NSR for a hypothetical, commercial full-time worker (40 hours per week).
- Reducing the mass of contaminants in the vadose zone.
- Controlling the potential migration of soil vapor from the Property to the 60 Tufts Street property.

Capuano Center

The remedial system at the Capuano Center is an SSDS that began operating on February 1, 2007. The SSDS installation also included sealing the slab/wall joint in the southern portion of the eastern wing of the Capuano Center to limit potential migration of soil vapor to indoor air. No off-gas treatment is required for the SSDS. The objectives of the Capuano Center remedial system have been achieved and include: eliminating or mitigating the soil vapor exposure pathway to indoor air; eliminating or mitigating the CEP to the extent feasible; and achieving a condition of NSR for occupants of the Capuano Center.

60 Tufts Street

The remedial system at the 60 Tufts Street property is an SSDS that began operating in April 2009. No off-gas treatment is required for the SSDS. The objectives of the 60 Tufts Street remedial system are to eliminate or mitigate, to the extent feasible, the soil vapor exposure pathway to indoor air and the CEP, and to achieve a condition of NSR for residents.

Residential and Commercial Properties

Based on groundwater, soil, soil vapor, and indoor air sampling results, GEI identified a several-block area near the Property for evaluation of soil vapor intrusion as a potential exposure pathway. Except to the extent it originates from other sources, the presence of PCE above laboratory reporting limits in the living space of an occupied residential dwelling at the Site constitutes a CEP. GEI is recommending EPEMs to eliminate or mitigate, to the extent feasible, the potential vapor intrusion pathway at 29 buildings and continues to evaluate additional selected buildings within the Site.

The EPEM designs are categorized as Option 1, Option 2, or Option 3, as conceptually defined below:

- Option 1 – SSDS: This option includes the installation of one or more sub-slab vapor extraction points and a collection piping network connected to an electric fan that discharges above the eave line of the roof. To date, no SSDSs (except for the

50 Tufts Street system) require off-gas treatment. This option is installed in buildings with adequate sub-slab air flow and a competent concrete slab, or those properties where vapor barrier and venting systems are infeasible.

- Option 2 – Vapor Trench: The vapor trench option consists of a sub-slab venting system installed in a shallow trench around the interior basement perimeter, cement stucco applied to the walls, and an epoxy vapor barrier applied to the slab and stucco walls. This option is installed in buildings with poor sub-slab air flow and a competent concrete slab. Sub-slab vapors are vented through a piping network that discharges above the eave line of the roof.
- Option 3 – New Slab: The new slab installation option consists of installing a new concrete slab, a sub-slab vapor barrier, and a floor venting system; applying cement stucco to the walls; and applying an epoxy vapor barrier to the new slab and stucco walls. This option is installed in buildings with poor sub-slab air flow and an incompetent concrete slab. Sub-slab vapors are vented through a piping network that discharges above the eave line of the roof.

The objectives of the EPEMs are to:

- Eliminate or mitigate, to the extent feasible, the potential soil vapor exposure pathway to indoor air.
- Achieve a condition of NSR for occupants of the residence or commercial building.

Through June 30, 2009, EPEMs have been, or are in the process of being, installed at 17 buildings.

Property Access Issues and Schedule

Property access issues include reaching agreement on terms of access to conduct sampling and mitigation and making contact with absentee property owners. Some property owners have either not executed access agreements or refused to allow sampling or mitigation work. GEI has continued to correspond with property owners about the need for sampling and mitigation, meet with property owners to explain the mitigation process, and work with property owners and other stakeholders to facilitate access.

UniFirst and GEI will continue to evaluate and mitigate properties under Phase IV and anticipate mitigation will extend into 2010. There will likely be some property owners that continue to refuse sampling or mitigation.

1. Introduction

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. (GEI) prepared this Phase IV Remedy Implementation Plan (RIP) for the site located at 50 Tufts Street in Somerville, Massachusetts (the Site) (Fig. 1). The Site is identified by Massachusetts Department of Environmental Protection (DEP) Release Tracking Number (RTN) 3-23246. The Site includes the 50 Tufts Street property (the Property), other properties in the neighborhoods east and immediately north, south and west of the Property, and the Michael E. Capuano Early Childhood Center (Capuano Center) located at 150 Glen Street in Somerville, Massachusetts (Fig. 2).

1.1 Site Contacts (310 CMR 40.0874(3)(a))

Person responsible for submittal of the RIP:

John R. Badey
Vice President of Distribution & Engineering
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887
978-658-8888

Licensed Site Professional

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801
781-721-4012
LSP License No. 9719

Person who will own, operate, and/or maintain the selected Remedial Action Alternative during and following construction

John R. Badey
Vice President of Distribution & Engineering
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887
978-658-8888

1.2 Background

From approximately 1955 to 2002, the Property was used for storage and distribution of industrial chemicals, laundry supplies, and dry cleaning supplies. Chemicals stored at and transported to and from the Property included chlorinated solvents, which are chlorinated volatile organic compounds (VOCs). These chlorinated VOCs – particularly tetrachloroethylene (also called perchloroethylene [PCE]), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) – have been detected in soil, soil vapor, indoor air, and groundwater at the Property and are therefore the compounds of potential concern (COPCs) for the Site.

In 2002, a release of chlorinated VOCs to soil and groundwater at the Property was reported to the DEP and assigned RTN 3-23246. Three other RTNs were subsequently issued for the Site: 3-24358, 3-24376, and 3-26114. For tracking and reporting purposes, these RTNs have been consolidated under RTN 3-23246. Subsequent investigations performed at the Property from 2002 until 2006 identified chlorinated VOCs in indoor air at the Property, and in groundwater and indoor air at residential properties near the Property. On November 9, 2005, DEP issued a Notice of Responsibility (NOR) to UniFirst and identified UniFirst as a potentially responsible party (PRP).

Chlorinated VOCs have been detected in soil, soil vapor, shallow and deep groundwater, and indoor air at portions of the Site. Chlorinated solvents were also detected in storm drain water samples near the Property; however, this is being addressed under a separate RTN (3-28231). The detection of chlorinated VOCs in indoor air at some buildings required the implementation of an Immediate Response Action (IRA). IRA activities by UniFirst began at the Site in March 2006, and to date have primarily included:

- Conducting Site-wide indoor air and subsurface sampling and testing.
- Mitigating vapor intrusion pathways identified by measurable concentrations of chlorinated VOCs above laboratory reporting limits in living or working spaces in occupied residences and at the Capuano Center. This is defined as a Critical Exposure Pathway (CEP) in the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000).
- Mitigating vapor intrusion pathways identified by concentrations of chlorinated VOCs measured in indoor air at commercial buildings above those that would constitute a condition of No Significant Risk (NSR), based on a Method 3 Risk Characterization.

In July 2008, on behalf of UniFirst, GEI completed a Phase II Comprehensive Site Assessment (CSA), Method 3 Risk Characterization, and a Phase III Remedial Action Plan (RAP) for the Site.

The CSA and RAP identified the following areas of the Site requiring investigations and mitigation:

- The Property;
- The Capuano Center;
- 60 Tufts Street, a 17 unit condominium building north of the Property; and
- Certain residences and commercial buildings located in the vicinity of the Property.

The remedial action alternative (RAA) selected by the Phase III evaluation included:

- Installing Exposure Pathway Elimination Measures (EPEMs) to the extent feasible (e.g. vapor barrier and venting system, or sub-slab depressurization systems (SSDSs)) and recording Activity and Use Limitations (AULs) for residences or schools with CEPs, or occupied commercial buildings with concentrations of chlorinated VOCs in indoor air that exceed concentrations that would constitute a condition of NSR.
- Continuing to operate the soil vapor extraction (SVE) system at the Property to remove contaminants from the vadose zone.
- Conducting a Site-wide Monitored Natural Attenuation (MNA) program to evaluate overburden and bedrock groundwater plume concentrations over time to assess the rate of natural attenuation processes, and to confirm that groundwater concentrations of chlorinated VOCs are generally stable or decreasing.

Elements of the selected Phase III remedy (i.e., the Comprehensive Remedial Action (CRA)) were initiated, and partially completed, as IRA activities for the Site (Fig. 3). Details regarding the IRA activities completed through June 30, 2009 have been provided to DEP in IRA Status Reports Nos. 1 through 7 and Remedial Monitoring Reports (RMRs) Nos. 1 through 10.

The MNA program is ongoing. Once installation of EPEMs has been completed, the Site will operate in Remedy Operation Status (ROS) until a Permanent Solution is achieved. Portions of the Site may be closed under partial Response Action Outcome (RAO) Statements. Completing the installation of EPEMs to mitigate the vapor intrusion pathway will achieve a condition of NSR, and MNA will ultimately achieve a Permanent Solution for the Site.

1.3 Purpose and Scope

In accordance with the MCP (310 CMR 40.0871), the purpose of this RIP is to document the requirements for the design, construction, and implementation of the CRA selected as a result of the Phase III evaluation.

In accordance with 310 CMR 40.0874, this RIP includes the following information for the remedial actions to be conducted as part of Phase IV activities:

- A list of relevant contacts.
- Documentation of the engineering concepts and design criteria to be used for the design and construction of the CRA.
- Construction plans and specifications.
- Operation and Maintenance (O&M) Manuals.
- Health and Safety Plans (HASPs).
- A list of necessary permits, licenses, and/or approvals required for the design, construction, and/or operation of the CRA.
- A discussion of any Site access issues relevant to the implementation of the CRA.

The existing EPEMs at the Site and the SSDS/SVE system at the Property were previously designed, approved by DEP, and installed during IRA activities. Therefore, we have not provided engineering concepts, design criteria, construction plans, or specifications in this RIP for the existing systems. Similar information was previously provided to DEP as part of numerous IRA RMRs and IRA Plan Modifications and is summarized in Section 3 of this RIP. The details regarding the future operation, maintenance, and monitoring of the existing systems are provided in Section 5 of this RIP.

1.4 Public Involvement (310 CMR 40.1400)

UniFirst and GEI have conducted a series of community meetings to inform property owners, residents, and City of Somerville officials about the Site. The community meeting that presented the results of the Phase III RAP was conducted on February 24, 2009.

GEI will provide copies of this RIP to the local public document repositories that were established for the Site at the Somerville Central Public Library and at the City of Somerville (the City) Clerk's Office. GEI will also provide an electronic version of this report to the City for posting to the City's web site.

GEI sent letters to the City's Board of Health and Chief Municipal Officer informing them of the preparation of this report. Copies of the municipal notification letters are in Appendix A.

This report was submitted via the eDEP process. A copy of the eDEP Transmittal Form (BWSC-108) is provided in Appendix A.

2. Conceptual Site Model

GEI developed this Conceptual Site Model (CSM) to describe release mechanisms, contaminant distribution, and potential exposure pathways associated with the Site. This CSM is based upon the investigation data documented in the Phase II report, and IRA Status Reports Nos. 1 through 7.

2.1 Site History Overview and Current Conditions

The Site is in a commercial/residential zoning district and includes the Property, together with portions of residential and commercial properties in the neighborhoods east and immediately north, south and west of the Property, and the Capuano Center.

According to Sanborn Fire Insurance Maps (Sanborn Maps) obtained from Environmental Data Resources (EDR) of Milford, Connecticut, from 1874 through at least 1900, residences were located on the Property. By 1933, most of the residences on the Property had been razed, and by 1950 no structures were located on the Property. An office building and warehouse was constructed on the Property in 1955. The warehouse was expanded in 1977. The nature of the business conducted at the Property from 1955 until 2002, when operations ceased, was the storage and distribution of industrial chemicals, laundry supplies, and dry cleaning supplies. The Property is approximately 51,111 square feet (ft^2) and developed with an approximately 20,594-ft^2, one-story, masonry block building.

From 1888 until the present, the prevailing land use at the Site has been residential, but also has included commercial uses. The residences existing today are a mix of single and multi-family houses. A railroad is located between the Property and Alston Street and has been present at the Site since at least 1888. Sanborn Maps indicate that before 60 Tufts Street was converted into condominiums in approximately 1999, the property was a church (c. 1880-1933), a theater (c. 1933-1989), and a warehouse (c. 1989-1999).

The Capuano Center property was undeveloped land with a small pond located on the northern part of the property until it was developed into a playground in approximately 1950. The property remained a playground from approximately 1950 until 2001 when the City took the playground and several abutting residences by eminent domain to build the Capuano Center. The Capuano Center is an 85,448-ft^2, 2-story public school located on an approximately 172,509-ft^2 developed lot.

2.2 Potential Contaminant Sources

Chlorinated VOCs, particularly PCE, have been measured in soil, groundwater, soil vapor, and indoor air within portions of the Site. TCE and TCA have also been measured in soil, groundwater and soil vapor at the Property. These three chlorinated VOCs are the principal COPCs at the Site. Historically, all three of these chlorinated VOCs were delivered to, stored at, handled, or distributed from the Property.

The information gathered during the Site assessment indicates that subsurface sources at the Site are not resulting in increasing concentrations of contaminants in any media throughout the available monitoring network.

2.3 Contaminant Distribution

2.3.1 Soil

COPCs found in Site soil primarily consist of PCE and TCE in soil at the Property. The highest concentrations of PCE and TCE measured in soil were located beneath the Property building slab.

At the Property, an SSDS began operating on April 30, 2007, and an SVE system began operating on August 22, 2007. Through June 30, 2009, the operation of the SSDS and SVE system had removed approximately 5,648 lbs of VOCs from the subsurface. The operation of the SSDS and SVE system has reduced the concentrations and mass of chlorinated VOCs in the vadose soil.

2.3.2 DNAPL

DNAPL has not been observed in Site monitoring wells or in groundwater or soil samples collected from the Site. However, multiple lines of evidence indicate that DNAPL is likely present in overburden down to the top of bedrock (and possibly in bedrock) at the Site. A complete assessment of DNAPL presence and distribution by Bernard Kueper, Ph.D. was included in the Phase II CSA.

The majority of DNAPL at the Site exists as residual DNAPL, which is immobile. Connected phase DNAPL that may be present at the Site has reached a steady state and is not migrating.

It is likely that DNAPL is present:

- At various locations beneath the Property building footprint.
- North of the building footprint extending beneath the paved areas.

- East of the building footprint extending across Tufts Street.
- South of the building footprint extending beneath the paved areas.
- West of the building footprint extending to the adjacent property.

2.3.3 Groundwater

Dissolved phase chlorinated VOCs have been measured in the overburden groundwater (fill, silt and till) and bedrock groundwater (argillite) at the Property and to the south and east. The central portion of the overburden groundwater plume is characterized by the presence of elevated concentrations of dissolved chlorinated VOCs, particularly PCE. The co-mingled PCE, TCE, and TCA plumes generally extend to the east and southeast of the Property, consistent with prevailing groundwater flow directions.

The shallow overburden groundwater plume is bounded approximately by Alston Street, Cross Street, Glen Street, Oliver Street, and Franklin Avenue. Very low concentrations (less than approximately 300 micrograms per liter (µg/l)) of PCE have been detected in groundwater collected from wells in deep overburden and bedrock near the eastern Site boundary.

2.3.4 Underground Utilities

Dissolved phase chlorinated VOCs have been detected in storm drains and sanitary sewers located below the water table in the southern portion of the Site along Franklin Street and Washington Street. The detection of chlorinated VOCs in the Massachusetts Bay Transportation Authority (MBTA) storm drain system near the Property is being addressed under a separate RTN (3-28231).

2.3.5 Vapor Intrusion and Indoor Air

In some buildings within the Site, chlorinated VOCs have been detected in indoor air samples. Where such detections coincide with elevated chlorinated VOC concentrations measured in soil vapor and groundwater, these lines of evidence tend to indicate a complete pathway from soil vapor into indoor air. Whether and to what extent a complete pathway may exist has proven to be highly site-specific, depending on, among other things, location, soil type, foundation characteristics, and building design and condition. Elevated concentrations of chlorinated VOCs detected in soil vapor samples generally coincided with elevated concentrations of chlorinated VOCs in the groundwater plume. Soil vapor concentrations of chlorinated VOCs diminish quickly beyond the edges of the overburden groundwater plume. PCE has not been detected in indoor air at properties over the outer portions of the shallow groundwater plume.

2.4 Source Characterization

According to the MCP (310 CMR 40.0000), a source of oil or hazardous materials (OHM) which *is resulting or is likely to result in an increase in concentrations* of OHM in an environmental medium either by direct discharge or by intermedia transfer (310 CMR 40.1003(5)) must be eliminated or controlled in order to achieve a Permanent Solution and a Class A or B RAO. To achieve a Temporary Solution and a Class C RAO, such an uncontrolled source must be eliminated, controlled, or mitigated to the extent feasible. By contrast, if the dissolved phase groundwater plume has reached a steady state and any DNAPLs are not migrating, as is the case with this Site, then there is no source that is resulting in or is likely to result in an increase in concentrations of OHM in an environmental medium, and the source control criteria do not apply.

More specifically, at this Site:

- The residual DNAPL and connected phase DNAPL are not migrating and exist in a stable configuration because of capillary trapping forces. The stability of the DNAPL is consistent with the stable groundwater concentrations in monitoring wells within the area of likely DNAPL occurrence.
- The dissolved phase groundwater plumes are at steady-state across the network of monitoring wells in both the overburden and bedrock.
- The DNAPL and the dissolved phase groundwater plumes are stable and are not causing an increase in concentrations of VOCs in groundwater, soil, soil vapor, or indoor air.

2.5 Receptors and Potential Exposure Pathways

Potential exposure pathways at the Site based on distribution of Site contaminants include:

- Ingestion and dermal contact with soil by a current and future commercial worker, resident, trespasser, visitor, student, teacher, railroad worker, and landscaper; and a future utility worker and construction worker.
- Ingestion and dermal contact with groundwater by a future utility worker.
- Inhalation of air in an excavation by a future utility worker and construction worker.
- Inhalation of indoor air by current and potential future occupants of commercial buildings.
- Inhalation of outdoor air by a current and future commercial worker, resident, trespasser, visitor, student, teacher, railroad worker, and landscaper.

3. Engineering Design (310 CMR 40.0874(3)(b))

This section of the RIP presents the engineering concepts and design criteria to be used for design and construction of the selected CRA. The existing EPEMs at the Site and the SSDS/SVE system at the Property were previously designed, approved by DEP, and installed as part of IRA activities (properties with existing remedial systems are shown in Fig. 3), and the designs of the installed systems are summarized in this report. Details regarding the operation, maintenance, and monitoring of existing and proposed systems are provided in Section 5 and Appendix B of this RIP.

AULs and MNA, two components of the CRA for the Site, do not require engineering design and construction activities. Therefore, many of the required elements of a RIP, such as conceptual plans, waste management procedures, and design features to control accidental releases, are not applicable to the MNA and AUL components of the CRA. Details of the proposed MNA program are in Section 6.

3.1 CRA Goals and Performance Requirements

Based on the results of the Method 3 Risk Characterization and as presented in the Phase III RAP, the following Remedial Objectives were identified for the CRA:

Remedial Objective	Location	Remedial Objective Description	Exposure Media	Primary COPCs
1	Residences	Mitigate potential inhalation exposure to the extent feasible.	Indoor Air	Chlorinated VOCs (PCE, TCE, TCA)
2	Capuano Center	Mitigate potential inhalation exposure to the extent feasible.	Indoor Air	Chlorinated VOCs
3	Commercial buildings	Mitigate potential inhalation exposure to reach NSR.	Indoor Air	Chlorinated VOCs

To meet the Remedial Objectives for each location, the CRA must, to the extent feasible, eliminate or mitigate the vapor intrusion pathway or the concentration of chlorinated VOCs in groundwater must be reduced to a level such that it does not cause vapor intrusion.

To achieve these objectives, the Phase III RAP proposed the following remedial actions:

- Install EPEMs to the extent feasible (e.g., vapor barrier and venting system, or SSDSs) and record AULs for properties where chlorinated VOCs were detected in the occupied space of a residence or school (i.e., a CEP) or concentrations of chlorinated

VOCs measured in occupied commercial buildings exceed those constituting a condition of NSR.

- Continue the operation of the SVE system at the Property to remove contaminants from the vadose zone.
- Conduct a Site-wide MNA program to evaluate overburden and bedrock groundwater plume concentrations over time to assess the rate of natural attenuation processes, and to confirm that groundwater concentrations of chlorinated VOCs are generally stable or decreasing.

The Phase III RAP concluded that the CRA, as well as the other RAAs evaluated, would not achieve background since it could not reasonably eliminate dissolved-phase contaminants in bedrock groundwater or residual DNAPL potentially present in bedrock fractures. Therefore, approaching background at this Site is considered infeasible.

3.2 Site-Specific Characteristics Affecting the Design, Construction, or Operation of the CRA

The engineering design to mitigate vapor intrusion into individual buildings depends upon location of the building within the plume, the nature of each building's construction and subsurface conditions. Key design considerations include:

- The type of foundations and basements. Many of the buildings are more than 50 years old and have building conditions (e.g., fieldstone and brick foundations, sumps, and dirt floors) that are more conducive to vapor intrusion.
- The type of soil beneath the buildings. Many of the buildings are located on a low permeability silty sand, which limits the area of influence of standard SSDSs.
- The seasonally variable groundwater table. If the groundwater table rises near or above the elevation of the basement slab it will affect the performance of SSDSs or other mitigation systems.
- Access to individual buildings. The buildings requiring mitigation are owned by multiple third parties, who must provide access and consent for installation, maintenance and inspection of any EPEM. Some owners have not granted access, making mitigation infeasible.

3.3 Remedial Actions Completed Through June 2009

The following remedial systems were designed, approved by DEP, and installed as part of IRA activities. Detailed descriptions of these remedial systems therefore are not reiterated in this report. The properties at the Site with existing remedial systems are shown in Fig. 3 and a summary of the remedial actions completed through June 30, 2009 is presented in Table 1.

Details regarding the Phase IV operation, maintenance, and monitoring of these existing systems are provided in Section 5 and Appendix B of this RIP.

3.3.1 50 Tufts Street Property

3.3.1.1 Background

The remedial system at the Property was originally designed and constructed as an SSDS. The proposed SSDS design was submitted to DEP in IRA Plan Modification No. 5 dated May 5, 2007. T Ford Company Inc. (T Ford) of Georgetown, Massachusetts installed the original SSDS between March 21 and April 27, 2007. A detailed description of the system and plans showing the system layout and monitoring locations are presented in Appendix B. GEI began operating the SSDS on April 30, 2007.

The SSDS design included 22 sub-slab extraction points inside the building, a 15 horsepower (HP) regenerative blower with pressure gauges, controls, and particulate filter, and 2,000-pound activated carbon adsorbers operated in series for off-gas treatment. As part of the SSDS installation, the building slab was sealed to minimize vapor transmission through the slab. The cracks and joints in the building slab were filled with flexible sealant and a two-part epoxy coating was applied to the surface of the slab.

In July and August 2007, SVE components were added to the system. The proposed design for the SVE modification was submitted to DEP in IRA Plan Modification No. 8 dated October 11, 2007. GEI began operating the SVE system on August 22, 2007. The SVE system includes seven soil vapor extraction points installed below the pavement in the north and south parking lots on the Property. The SSDS and the SVE system rely upon shared equipment, including the piping manifold, blower assembly, and off-gas treatment units.

3.3.1.2 Remedial Objectives

The objectives of the combined SSDS/SVE system are to:

- Eliminate or mitigate, to the extent feasible, the soil vapor exposure pathway to indoor air.
- Eliminate Imminent Hazard (IH) conditions at the Property and achieve a condition of NSR for a hypothetical, commercial full-time worker (40 hours per week).
- Reduce the mass of contaminants in the vadose zone.
- Control the potential migration of soil vapor from the Property to the 60 Tufts Street property.

3.3.1.3 Efficiency and Effectiveness

The SSDS monitoring data show that the sub-slab vacuum field generated by the SSDS covers most of the building slab area. In conjunction with the physical sealing of the slab, this indicates the soil vapor migration pathway to indoor air is being mitigated by the system. Based on indoor air testing results collected since the combined system has been operating, the conditions at the Property do not pose an IH, and a condition of NSR for full-time commercial workers has been achieved for the building at the Property.

The monitoring data collected for the SVE system show the vacuum influence from the SVE points in the south parking lot extends approximately 30 feet south from the building and from the SVE points in the north parking lot extends onto the 60 Tufts Street property. This indicates that potential migration of soil vapor from the Property to 60 Tufts Street is being mitigated.

Monitoring data from both the SSDS and SVE components through June 30, 2009 show that approximately 5,648 lbs of VOCs have been removed from the vadose zone at the Property.

3.3.1.4 Control of Spills/Releases or System Malfunctions

The pipe and hose connections on the pressure side of the blower are examined during the maintenance visits for leaks. Leaks, if encountered, are corrected immediately. Procedures to address spills of spent activated carbon during carbon change-outs have been developed and are presented in the system O&M Manual (Appendix B).

Except for scheduled maintenance activities, the system is designed to operate continuously. It is equipped with an auto-dialer, cellular modem, and flow switch to notify GEI if the electrical power supply to the blower is interrupted or if the air flow through the blower ceases.

The system is operated in general accordance with DEP Policy #WSC-94-150: "Off-gas Treatment of Point-Source Remedial Air Emissions" and "Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems (December 1995)." Copies of the DEP policy and guideline are in the system O&M Manual in Appendix B.

3.3.1.5 Management of Waste Materials

The waste soil generated during the installation of the SSDS and SVE system was shipped off-site for disposal as described in IRA Status Reports Nos. 4 through 7.

The two waste streams generated by ongoing operation of the system include:

- Spent Activated Carbon – Several times per year, the used carbon from the off-gas treatment carbon adsorbers is transferred by a vacuum truck into 55-gallon steel drums and transported off-site the same day for disposal at a licensed facility. The spent carbon is currently shipped under a hazardous waste manifest by a licensed hazardous waste hauler to Rineco of Benton, Arkansas for use by cement kilns as a waste-derived fuel. Based on the previous quantities of spent carbon generated by the system, a Large Quantity Generator (LQG) application was submitted to the U.S. Environmental Protection Agency (EPA) on July 11, 2008. Currently, however, the volume of spent carbon generated in any calendar month or annually for disposal classifies the system as a Small Quantity Generator (SQG) of hazardous waste.
- Condensate – Infrequently, condensate in system piping may accumulate in the moisture separator installed as part of the blower assembly. If observed, the liquid is drained from the moisture separator and placed in the lead carbon adsorber where the water evaporates and the contaminants, if present, adsorb to the carbon, pending off-site disposal.

3.3.1.6 Consideration of Site-Specific Characteristics

The building at the Property is used for commercial warehouse storage space. The system was designed and is operated to support ongoing use of the Property for this purpose. The primary controls, valves, mechanical blower, and carbon adsorbers are located outside the building in secure enclosures for ease of maintenance access. The manholes housing the SVE points are H-25 heavy duty rated for truck traffic. The epoxy coating for the building slab is designed for commercial/industrial use.

3.3.1.7 Inspection and Monitoring

The system has been monitored in general accordance with DEP Policy #WSC-94-150 and monitoring plans previously submitted to DEP. Operational parameters for the system (e.g., flow rate, vacuum, off-gas treatment efficiency) are monitored monthly. Indoor air testing and sub-slab pressure measurement over the past 2 ½ years has demonstrated the effectiveness of the SSDS. GEI will submit an IRA Modification under separate cover, requesting discontinuing annual indoor air sampling. A detailed description of the Phase IV monitoring program is presented in Section 5 of this RIP.

3.3.1.8 Future Phase IV Activities

The system is achieving the remedial design objectives and O&M activities will continue as described in Section 5 of this RIP. No significant modifications to the system equipment are proposed in the near future. However, the design allows for the SSDS system to be converted to passive operation, when appropriate. The SVE portion of the system is

expected to be operated until residual DNAPL has been largely removed from the vadose zone at the Property.

An AUL will be recorded for the Property to support long-term operation of the system.

Based on the current rate of hazardous waste generation represented by the spent activated carbon (less than 1,000 kilograms per month), the status for the SSDS/SVE system will be revised from LQG to SQG of Hazardous Waste. A Notification of Hazardous Waste Activity in Massachusetts form has been prepared for submittal to DEP.

3.3.2 Capuano Center

3.3.2.1 Background

The original SSDS design was submitted to the DEP in IRA Plan Modification No. 4 dated February 22, 2007. T Ford installed the SSDS between January 27 and 31, 2007. A detailed description of the system and plans showing the system layout and monitoring locations are presented in Appendix B. GEI began operating the SSDS on February 1, 2007.

To further reduce potential soil vapor migration into the Capuano Center, in August 2007, Concrete Restoration of Winchester, Massachusetts sealed the interior slab/exterior wall joint in six classrooms of the east wing of the Capuano Center. The proposed modification was submitted to DEP in IRA Plan Modification No. 7 dated October 11, 2007.

The SSDS design includes 18 sub-slab extraction points in six classrooms (installed horizontally through the exterior wall of the east wing) attached to three collection headers in exterior underground trenches, and a 1.5 HP regenerative blower with pressure gauges, controls, and particulate filter housed in a garden-style shed. Based upon the measured flow rate and VOC concentration, the annual discharge rate of VOCs from the system has been significantly less than 100 lbs per year; therefore, no off-gas treatment is required per DEP Policy #WSC-94-150. A discharge pipe extends from the blower shed to above the roofline of the Capuano Center.

3.3.2.2 Remedial Objectives

The objectives of the Capuano Center remedial system are to:

- Eliminate or mitigate, to the extent feasible, the potential soil vapor exposure pathway to indoor air.
- Achieve a condition of NSR for occupants of the Capuano Center.

The SSDS monitoring data show that the sub-slab vacuum field generated by the SSDS influences the southern portion of the east wing. In conjunction with the physical sealing of the slab/wall joint, this indicates the soil vapor migration pathway to indoor air is controlled by the system. Based on indoor air testing results, a condition of NSR has been achieved for occupants of the Capuano Center and the CEP has been mitigated or eliminated, to the extent feasible.

3.3.2.3 Control of Spills or System Malfunctions

The soil vapor extracted by the SSDS does not require off-gas treatment prior to discharge. There are no other contaminated media generated by operation of the SSDS.

Except for scheduled maintenance activities, the system is designed to operate continuously. It is equipped with an auto-dialer, cellular modem, and flow switch to notify GEI if the electrical power supply to the blower is interrupted or if the air flow through the blower ceases.

The system is operated in general accordance with DEP Policy #WSC-94-150. Copies of the DEP policy and guideline are in the system O&M Manual in Appendix B.

3.3.2.4 Management of Waste Materials

The excess soil generated during the installation of the subsurface SSDS headers was shipped off-site for disposal as described in IRA Status Report No. 3 (RTN 3-23246) and IRA Status Report No. 1 (RTN 3-26114) dated May 10, 2007.

Infrequently, condensate in system piping may accumulate in the subsurface collection header pipes, the cleanout drain for the header pipes, or the moisture separator installed as part of the blower assembly. If observed, SSDS condensate is drained from the moisture separator or pumped from the headers into the cleanout, which drains into the subsurface at the property.

3.3.2.5 Consideration of Site-Specific Characteristics

The Capuano Center is an active educational facility. The SSDS was designed and is operated to support ongoing use of the building and property for this purpose. The controls, valves, and mechanical blower are located outside the building in a secure shed for ease of maintenance access. The sub-slab extraction points were installed through the exterior wall to eliminate piping above the slab inside the Capuano Center. The three collection headers were installed in trenches and daylight inside the blower shed to minimize above ground piping.

3.3.2.6 Inspection and Monitoring

The system has been monitored in accordance with DEP Policy #WSC-94-150 and previous IRA submittals to DEP. Operational parameters for the system (e.g., flow rate, vacuum) are monitored monthly and indoor air quality and sub-slab conditions are monitored three times per year. A detailed description of the Phase IV monitoring program is presented in Section 5 of this RIP.

3.3.2.7 Future Phase IV Activities

The system is achieving the remedial design objectives and O&M activities will continue as described in Section 5 of this RIP. No significant modifications to the system equipment are proposed in the near future; however, the design allows for the SSDS system to be converted to passive operation, when appropriate.

3.3.3 60 Tufts Street

3.3.3.1 Background

60 Tufts Street is a 17-unit condominium building north of the Property. The original SSDS design was submitted to DEP in IRA Status Report 7 dated May 11, 2009. Norfolk Services, Inc. (Norfolk) of Bridgewater, Massachusetts installed the SSDS between February 4 and April 7, 2009, and GEI began operation of the SSDS on April 24, 2009.

The SSDS includes 12 vertical sub-slab extraction points and two horizontal foundation wall extraction points connected to two collection headers and a 5 HP regenerative blower with pressure gauges, controls, and particulate filter housed in a locked metal enclosure. Based upon the measured flow rate and VOC concentration, the annual discharge rate of VOCs from the system will be significantly less than 100 lbs per year; therefore, no off-gas treatment is required per DEP Policy #WSC-94-150. A discharge pipe extends from the blower through a parking garage deck and discharges above the roofline of the building.

3.3.3.2 Remedial Objectives

The objectives of the 60 Tufts Street remedial system are to:

- Eliminate or mitigate, to the extent feasible, the potential soil vapor exposure pathway to indoor air.
- Achieve a condition of NSR for occupants of the building.

3.3.3.3 Efficiency and Effectiveness

The SSDS monitoring data show that the sub-slab vacuum field generated by the SSDS influences nearly the entire floor slab area. Preliminary indoor air testing results indicate that a condition of NSR has been achieved for building occupants at 60 Tufts Street and the CEP has been mitigated to the extent feasible.

3.3.3.4 Control of Spills or System Malfunctions

The soil vapor extracted by the SSDS does not require off-gas treatment prior to discharge. There are no other contaminated media generated by operation of the SSDS.

Except for scheduled maintenance activities, the system is designed to operate continuously. It is equipped with an auto-dialer, cellular modem, and flow switch to notify GEI if the electrical power supply to the blower is interrupted or if the air flow through the blower ceases.

The system is operated in general accordance with DEP Policy #WSC-94-150. Copies of the DEP policy and guideline are in the system O&M Manual in Appendix B.

3.3.3.5 Management of Waste Materials

The excess soil generated during the installation of the sub-slab extraction points was transported off-site by TMC Services, Inc. (TMC) of Bellingham, Massachusetts under a hazardous waste manifest. Disposal documentation will be reported in the next IRA Status Report. Concrete and brick waste generated during SSDS installations was disposed of as construction debris after chemical testing results confirmed that chlorinated VOCs were not detected in the samples.

Infrequently, condensate in system piping may accumulate in the subsurface collection header pipes, the cleanout drain for the header pipes, or the moisture separator installed as part of the blower assembly. If observed, SSDS condensate is drained from the moisture separator or pumped from the headers into the cleanout which drains into the subsurface at the property.

3.3.3.6 Consideration of Site Specific Characteristics

The 60 Tufts Street building includes 17 individual condominium units and 18 deeded storage areas. The SSDS piping was positioned to minimize the impact on residents' living and storage space. In addition, the blower enclosure was positioned outside the southern corner of the building in a location that minimizes the impact on parking. The system may be monitored and controlled at the blower enclosure for ease of maintenance access.

3.3.3.7 Inspection and Monitoring

The system has been monitored in accordance with DEP Policy #WSC-94-150. Operational parameters for the system (e.g., flow rate, vacuum) are monitored monthly and indoor air quality and sub-slab conditions will be monitored annually for the next two years during the winter months. A detailed description of the Phase IV monitoring program is presented in Section 5 of this RIP.

3.3.3.8 Future Phase IV Activities

The system is achieving the remedial design objectives and O&M activities will continue as described in Section 5 of this RIP. No significant modifications to the system equipment are proposed in the near future.

We expect that the SSDS will remove the VOC contaminant mass from the sub-slab soil vapor over a limited period of time. We therefore plan to operate the SSDS for a limited period of time, and, assuming that is successful, we do not anticipate recording an AUL for the 60 Tufts Street property.

3.3.4 Residential and Commercial Properties

3.3.4.1 Background

Based on groundwater, soil, soil vapor, and indoor air sampling results, GEI identified a several-block area near the Property for evaluation of soil vapor intrusion as a potential exposure pathway. Except to the extent it originates from other sources, the presence of PCE above laboratory reporting limits in the living space of an occupied residential dwelling at the Site constitutes a CEP. In IRA Plan Modification Nos. 1 and 4, GEI presented a process to evaluate residential and commercial buildings and address identified vapor intrusion exposure pathways. Presently, GEI is recommending EPEMs for 29 properties (excluding the Property, the Capuano Center, and 60 Tufts Street) and continues to evaluate selected buildings within the Site. Through June 30, 2009, EPEMs were installed at 17 residential and commercial properties, one of which is still in progress. Fig. 3 shows the buildings with EPEMs installed and those which are proposed. Table 1 presents the as-built design information for each installed EPEM.

Prior to installing EPEMs in residences, GEI installed indoor air purifiers with activated carbon filters as a temporary mitigation measure. GEI maintains the air purifiers installed in residences and changes the carbon filters approximately every six months. Air purifiers are removed from a residence when an EPEM is installed.

The EPEM designs are categorized as Option 1, Option 2, or Option 3 as conceptually defined below:

- Option 1 – SSDS: This option includes the installation of one or more sub-slab vapor extraction points and a collection piping network connected to an electric fan located outside the building envelope. The fan is equipped with a condensate bypass drain and the fan exhaust is discharged above the eave line of the roof. To date, no SSDSs (except for the system at the Property) require off-gas treatment. This option is installed in buildings with adequate sub-slab air flow and a competent concrete slab, or those properties where vapor barrier and venting systems are infeasible.
- Option 2 – Vapor Trench: The vapor trench option consists of a sub-slab venting system installed in a shallow trench around the interior basement perimeter, cement stucco applied to the walls, and an epoxy vapor barrier applied to the slab and stucco walls. The trench is backfilled with crushed stone and finished with approximately three inches of new concrete to meet the existing slab surface. This option is installed in buildings with poor sub-slab air flow, a competent concrete slab, and a fieldstone and/or brick foundation. Sub-slab vapors are vented through a piping network that exits the building envelope at the sill elevation and terminates above the eave line of the roof.
- Option 3 – New Slab: The new slab installation option consists of installing a new concrete slab, a sub-slab vapor barrier, and a floor venting system; applying cement stucco to the walls; and applying an epoxy vapor barrier to the new slab and stucco walls. This option is installed in buildings with poor sub-slab air flow, an incompetent concrete slab, and a fieldstone and/or brick foundation. As with Option 2, sub-slab vapors are vented through a piping network that exits the building envelope at the sill elevation and terminates above the eave line of the roof.

The decision making process for selecting a conceptual design based on site-specific conditions is illustrated in Fig. 4. Figs. 5 through 7 present the conceptual plans and specifications for the EPEM design options. Table 1 identifies the design option for each EPEM currently installed and the primary engineering components of each.

3.3.4.2 Remedial Objectives

The objectives of the EPEMs are to:

- Eliminate or mitigate, to the extent feasible, the potential soil vapor exposure pathway to indoor air.
- Achieve a condition of NSR for occupants of the residence or commercial building.

3.3.4.3 Efficiency and Effectiveness

For residential buildings, the primary standard for successful EPEM performance is the reduction of chlorinated VOC concentrations in indoor air to below laboratory reporting limits, to the extent feasible, and to achieve a condition of NSR. For commercial buildings, the primary standard for successful EPEM performance is the reduction of chlorinated VOC concentrations in indoor air to achieve a condition of NSR.

Through June 30, 2009, the results of post-EPEM installation indoor air sampling indicate that 13 of 16 of the EPEMs installed and tested have achieved the remedial objectives. The remaining three systems will be modified to improve EPEM performance based on the initial results.

3.3.4.4 Control of Spills or System Malfunctions

Based upon the flow rate and VOC concentrations observed at a property with the highest soil vapor concentrations, the annual discharge rate of VOCs from each system is significantly less than 100 lbs per year; therefore, no off-gas treatment is required for EPEMs per DEP Policy #WSC-94-150. There are no other contaminated media generated by the EPEMs after they are installed.

EPEM Option 1 (i.e., SSDS) is designed to operate continuously for the life of the building. A liquid-level manometer is installed in the primary extraction pipe of each SSDS and serves as a visual indicator to the building owner that the system is operating. Each building owner has been provided contact information for GEI in the event of a malfunction.

For EPEM Options 2 and 3, signs will be posted in the building to warn occupants not to penetrate the wall or floor vapor barriers for the life of the home, consistent with the provisions of the proposed AUL. Each building owner has been provided contact information for GEI.

3.3.4.5 Management of Waste Materials

As documented in the IRA Status Reports, excess soil and concrete generated during installation of EPEMs was analyzed for VOCs and if no VOCs were detected, the material was disposed of as construction debris. Soil or concrete with detectable concentrations of VOCs was disposed of as hazardous waste at a licensed facility.

3.3.4.6 Consideration of Site-Specific Characteristics

Based upon an evaluation of the conditions at each building, one of the three EPEM conceptual design options was selected. Modifications were then made to the conceptual

design to address site-specific characteristics and achieve remedial objectives. The EPEM design process is described in more detail in Section 4 of this RIP.

3.3.4.7 Inspection and Monitoring

To evaluate the performance of the EPEM, indoor air samples are collected shortly after installation is complete. Following the post-installation indoor air sampling, indoor air samples will be collected one time per winter for the two consecutive years following installation of Option 1 EPEMs. Indoor air samples will be collected two times per year (including one winter sample) for the two consecutive years following installation of Option 2 and 3 EPEMs. The samples will be analyzed for site-specific chlorinated VOCs. During air sampling, the condition of the EPEM will be inspected and, if needed, repairs or modifications will be scheduled.

3.3.4.8 Future Phase IV Activities

As described in Section 3.3.4.3, most of the EPEMs are achieving the remedial design objectives as presently constructed. For EPEMs which have not yet met the remedial objectives, initial confirmatory sampling will be conducted or modifications will be made to the system, as necessary, and documented in the next Phase IV Status Report. O&M activities will continue for the EPEMs as described in Section 5 of this RIP.

It is anticipated that AULs will be recorded for each property where an EPEM is installed.

Copies of recorded AULs and EPEM monitoring results will be presented in future Phase IV RMRs.

3.4 New Phase IV Remedial Actions

3.4.1 EPEM Installations for Residential and Commercial Properties

Fig. 3 shows the properties for which EPEM installations are currently proposed as part of Phase IV activities. The design for each EPEM will be consistent with the design process illustrated in Fig. 4 and one of the three conceptual designs described in Section 3.3.3 of this RIP and shown in Figs. 5 through 7.

It is anticipated that AULs will be recorded for each property where an EPEM is installed.

3.4.2 MNA Program

An MNA program will be implemented as part of Phase IV activities to evaluate the on-going natural attenuation processes that may be occurring at the Site. The primary goals of the MNA program are:

- Plume Stability Evaluation – Evaluate overburden and bedrock groundwater plume concentrations over time to confirm that the groundwater plumes are stable, and that groundwater concentrations of chlorinated VOCs are not significantly increasing.
- Natural Attenuation Evaluation – Evaluate overburden and bedrock groundwater plume concentrations over time to assess the rate of natural attenuation processes, and to confirm that groundwater concentrations of chlorinated VOCs are generally stable or decreasing.

The details of the MNA program, including number and frequency of samples and analytical parameters, are presented in Section 6 of this RIP.

4. Construction Plans and Specifications (310 CMR 40.0874(3)(c))

Additional EPEM installations for selected properties are proposed as part of Phase IV construction activities. The three conceptual designs that are the basis for future EPEM installations were described in Section 3.3.3 of this RIP and are shown in Figs. 5 through 7. The typical specifications for EPEM construction are shown as notes in the engineering plans (Figs. 5 to 7).

Modifications to the conceptual designs are based on an engineering assessment of the site-specific conditions for each building. Significant deviations from the conceptual designs will be submitted to DEP for approval prior to construction. Deviations from the conceptual designs will be documented in future Phase IV RMRs.

5. O&M Manuals (310 CMR 40.0874(3)(d))

Summaries of the O&M activities for the existing or proposed remedial systems are presented below. Detailed O&M Manuals for each type of system are presented in Appendix B of this RIP.

5.1 50 Tufts Street Property

5.1.1 Operation

The system is operated in accordance with DEP Policy #WSC-94-150 and "Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems (December 1995)" (Appendix B).

Successful operation of the system requires minimal adjustments by the operator and relies primarily on continuous operation of the blower. System shutdowns are documented and corrected. The blower is powered from a dedicated electrical service panel located inside the building in the south office area. An auto-dialer system notifies GEI of major system malfunctions.

5.1.2 Maintenance

Routine maintenance is performed on a monthly basis. Maintenance tasks may include draining accumulated water from the moisture separator, changing the filter element for the blower, changing the batteries in the auto-dialer, replacing the carbon in the off-gas treatment adsorbers, and correcting deficiencies observed during routine inspection of system components.

5.1.3 Monitoring

The monitoring plan for the system complies with the requirements of DEP Policy #WSC-94-150, as well as site-specific requirements presented in MCP regulatory submittals from GEI to DEP.

On a monthly basis, system status and operating parameters are recorded, including whether the blower is operating normally, if alarm conditions are present, the current plumbing configuration of the carbon adsorbers, the total system flow rate, and air pressures and VOC concentrations of each header, the blower effluent, and influent and effluent of each carbon adsorber.

GEI will submit an IRA Modification under separate cover, requesting discontinuing annual indoor air sampling. GEI will continue to measure the vapor pressure of sub-slab extraction points and monitoring points. We anticipate using these sub-slab pressure measurements to confirm system effectiveness. Monitoring may be suspended, however, during any period when the building is vacant.

5.2 Capuano Center

5.2.1 Operation

The system is operated in accordance with DEP Policy #WSC-94-150 and "Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems (December 1995)" (Appendix B).

Successful operation of the system requires minimal adjustments by the operator and relies primarily on continuous operation of the blower. System shutdowns are documented and corrected. The blower is powered from a dedicated electrical service panel located inside the school building. An auto-dialer system notifies GEI of major system malfunctions.

5.2.2 Maintenance

Routine maintenance is performed on a monthly basis. Maintenance tasks may include documenting whether the blower is operating normally and if alarm conditions are present, draining accumulated water from the moisture separator or collection headers, changing the filter element for the blower, changing the batteries in the auto-dialer, and correcting deficiencies observed during routine inspection of system components.

5.2.3 Monitoring

The monitoring plan for the system complies with the requirements of DEP Policy #WSC-94-150, as well as site-specific requirements presented in MCP regulatory submittals from GEI to DEP.

Operating parameters are measured monthly, including the total system flow rate and the air pressures and VOC concentrations of each sub-slab monitoring point, sub-slab extraction point, header pipe, and the blower influent and effluent.

In addition to the monthly monitoring, samples of indoor and outdoor air are collected three times each year (February or March, August, and November) for laboratory analysis of site-specific chlorinated VOCs.

5.3 60 Tufts Street

5.3.1 Operation

The system is operated in accordance with DEP Policy #WSC-94-150 and "Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems (December 1995)" (Appendix B).

Successful operation of the system requires minimal adjustments by the operator and relies primarily on continuous operation of the blower. System shutdowns are documented and corrected. The blower is powered from a dedicated electrical service panel located inside the 60 Tufts building. An auto-dialer system notifies GEI of major system malfunctions.

5.3.2 Maintenance

Routine maintenance is performed on a monthly basis. Maintenance tasks may include draining accumulated water from the moisture separator or collection headers, changing the filter element for the blower, changing the batteries in the auto-dialer, and correcting deficiencies observed during routine inspection of system components.

5.3.3 Monitoring

At a minimum, the monitoring plan for the system complies with the requirements of DEP Policy #WSC-94-150.

On a monthly basis, the current system status is documented, including whether the blower is operating normally and if alarm conditions are present. Operating parameters are also measured monthly, including the total system flow rate and the air pressures and VOC concentrations of system influent and effluent.

In addition to the monthly monitoring, samples of indoor air are collected once per year during the winter months for laboratory analysis of site-specific chlorinated VOCs.

5.4 Residential and Commercial Properties

5.4.1 EPEM Option 1

5.4.1.1 Operation

The systems are operated in accordance with DEP Policy #WSC-94-150 and "Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems (December 1995)" (Appendix B).

Successful operation requires minimal adjustments and relies on the continuous operation of the fan. Fans are not equipped with exterior control switches and any adjustments to the fan must be made by the manufacturer or an authorized contractor.

5.4.1.2 Maintenance

Routine maintenance is not anticipated to be necessary; however, we will observe each system annually as described below.

5.4.1.3 Monitoring

For two years following the installation of the EPEM, or as modified and approved by DEP, samples of indoor air will be collected once per year during winter months for laboratory analysis of site-specific chlorinated VOCs. During indoor air sampling, the status and condition of the exterior piping, interior piping, fan, and concrete slab will be documented. The air pressure in the vent piping will also be recorded by reading the liquid level in the "U-Tube" manometer installed on one of the interior extraction pipes. We anticipate discontinuing indoor air sampling in the future and using sub-slab pressure measurements to verify system effectiveness.

5.4.2 EPEM Option 2

5.4.2.1 Operation

There are no mechanical moving parts to the system. The epoxy vapor barrier and stucco coating restrict sub-slab soil vapor migration through the basement floor and walls, and the sub-slab venting system installed in the shallow trench around the interior basement perimeter vents sub-slab soil vapor to the atmosphere above the roofline of the building.

5.4.2.2 Maintenance

Routine maintenance is not anticipated to be necessary.

5.4.2.3 Monitoring

For two years following the installation of the EPEM, or as modified and approved by DEP, samples of indoor air will be collected two times per year (once during winter months) for laboratory analysis of site-specific chlorinated VOCs. Annual inspections are performed to observe and document the condition of the exterior piping, interior piping, concrete slab, and foundation walls. We anticipate discontinuing indoor air sampling in the future and will conduct periodic inspections of the system to evaluate its integrity.

5.4.3 EPEM Option 3

5.4.3.1 Operation

There are no mechanical moving parts to the system. The epoxy vapor barrier and sub-slab high density polyethylene (HDPE) liner restrict sub-slab soil vapor migration through the basement walls and floor. In addition, sub-slab soil vapor is vented through sub-slab vent piping to the atmosphere above the roofline of the house.

5.4.3.2 Maintenance

Routine maintenance is not anticipated to be necessary.

5.4.3.3 Monitoring

For two years following the installation of the EPEM, or as modified and approved by DEP, samples of indoor air will be collected two times per year (once during winter months) for laboratory analysis of site-specific chlorinated VOCs. During indoor air sampling the condition of the exterior piping, interior piping, concrete slab, and foundation walls will be documented. We anticipate discontinuing indoor air sampling in the future and will conduct periodic inspections of the system to evaluate its integrity.

6. Monitored Natural Attenuation

6.1 Phase III Selection of MNA

MNA is included in the CRA to achieve a Permanent Solution at the Site. The CRA selected in the Phase III RAP for the Site is based on Phase II evaluations that indicate the overburden and bedrock groundwater plumes are stable. The Phase II evaluations also indicate that natural attenuation processes are occurring at the Site, which will likely reduce contaminant concentrations in groundwater over time.

6.1.1 Groundwater Plume Stability

The Phase II investigations indicate that historic releases of chlorinated VOCs have resulted in dissolved phase chlorinated VOCs, particularly PCE, TCE, and TCA, in overburden and bedrock groundwater at the Site. The co-mingled PCE, TCE, and TCA plumes generally extend east to southeast of the Property, consistent with prevailing groundwater flow. The Phase II investigations indicate that there are no known continuing sources of chlorinated VOCs at the Site.

The June 2008 report titled, "Assessment of Source Stability, Plume Stability, and Plume Response Time," by Bernard H. Kueper, which was included in the Phase II/III Report, concluded that PCE, TCE, and TCA groundwater plumes are stable or slightly decreasing. The plume stability was evaluated by considering concentration versus time data for available monitoring wells, and applying the Mann-Kendall statistical trend test (at both 80% and 90% confidence levels) to the data.

Since the completion of the Phase II, three additional rounds of groundwater sampling and testing were conducted and are documented in IRA Status Report No. 6 and RMR No. 9 and the IRA Completion Report. Based on our analysis of the Mann-Kendall statistical trend test results, which incorporates the additional groundwater testing data, in general the PCE, TCE, and TCA groundwater plumes continue to be stable or are slightly decreasing at the Site.

6.1.2 Natural Attenuation Processes

Data evaluated as part of the Phase II/III plume stability analysis generally indicate that concentrations of three VOCs (PCE, TCE, and TCA) in groundwater are remaining stable or slightly decreasing with time. The stable and decreasing trends of VOC concentrations are evidence that natural attenuation is likely occurring at the Site.

Further evidence that natural attenuation is likely occurring at the Site is the detection of daughter products and metabolites of PCE and TCE biodegradation, including trans-1,2-

dichloroethylene, cis-1,2-dichloroethylene, 1,1-dichloroethylene, and vinyl chloride in groundwater at the Site. The presence of these daughter products/metabolites indicates that dechlorination by natural attenuation is likely occurring.

In January 2007, selected groundwater samples were tested for VOCs and additional natural attenuation parameters to evaluate biologic and/or abiotic degradation processes that may affect the fate and transport of VOCs at the Site. Natural attenuation parameter testing in January 2007 included: alkalinity, arsenic, iron III, total organic compound (TOC), nitrate, nitrite, sulfate, sulfite, chloride, methane, ethane, pH, oxidation-reduction potential (ORP), conductance, and dissolved oxygen (DO).

Groundwater samples tested for these parameters were collected from monitoring wells near the source area. Results of the testing indicated that conditions favorable to natural attenuation were present at selected locations toward the edge of the source area (MW104). Additional testing and evaluation of these parameters in the groundwater plume is proposed as part of the MNA program discussed below.

6.2 MNA Program Objectives

As part of the Permanent Solution for the Site, we will implement an MNA program to evaluate the on-going natural attenuation that is believed to be occurring at the Site. The primary goals of the MNA program are:

- Plume Stability Monitoring – We will implement a groundwater sampling plan to monitor overburden and bedrock groundwater plume concentrations through time to confirm that the groundwater plumes are stable, and that groundwater concentrations of chlorinated VOCs are not significantly increasing.
- Natural Attenuation Evaluation – We will evaluate overburden and bedrock groundwater plume concentrations through time for indications of the presence and rate of natural attenuation processes.

The MNA program is described below in the MNA Operation, Maintenance, and Monitoring (OMM) Plan.

6.3 MNA OMM Plan (310 CMR 40.0874[3][d])

We developed the following OMM Plan for the MNA portion of the selected CRA. The implementation of the MNA portion of the CRA does require "Engineering Design" or "Construction Plans and Specifications," which are listed in the MCP (310 CMR 40.0874[3][b] and [c]). The OMM Plan provides a summary of the activities that we anticipate conducting to evaluate the MNA Program's achievement of the remedial goals listed in Section 6.2.

6.3.1 Groundwater Level Measurements

GEI will periodically measure groundwater levels at selected locations at the Site as part of the MNA program. The measurements will be used in plume stability and attenuation analyses as described in Section 6.3.3.

6.3.2 Groundwater Sampling

GEI will collect groundwater samples annually for 2 years and then every other year for 5 years. Groundwater samples will be collected from 14 overburden and bedrock monitoring wells (Fig. 8), which represent four key areas of the groundwater plume:

- Upgradient area: MW105.
- Former source area: MW202, MW-1, GEO-2, and MW-3.
- Plume mid-point area: MW112A, MW116, and MW122.
- Downgradient area: MW104, MW117S/T/D, MW118S/T/D, MW119S/T, MW120S/D, and MW121S/D.

Groundwater samples will be submitted to a laboratory for testing for selected VOCs by EPA Method 8260B, which is consistent with the existing groundwater monitoring program. Selected groundwater samples will also be submitted for natural attenuation parameter testing as described in Section 6.3.4.

The proposed groundwater sampling will be conducted in the spring to document conditions during high groundwater elevations. The frequency for the MNA groundwater sampling is based on the plume stability analysis performed by Dr. Bernard Kueper for the Phase II/III report, which indicates that the plume is stable and contaminants of concern are attenuating. We will periodically reevaluate the sampling locations, sampling frequency, and testing parameters included in this MNA program.

GEI will collect groundwater samples from monitoring wells using low-flow sampling techniques. If monitoring wells are dry, or the use of low-flow techniques are not possible, it will be noted in the semi-annual Phase IV RMRs (see Section 6.5 below).

6.3.3 Groundwater Plume Stability Analyses

As part of the MNA program, we will update and supplement the plume stability analysis previously performed by Dr. Bernard Kueper with the additional groundwater data collected through implementation of the groundwater monitoring plan.

6.3.4 Natural Attenuation Parameters Testing

As part of the MNA program we will test selected groundwater samples for one or more of the following natural attenuation parameters annually for 2 years and then every other year for 5 years..

- Methane
- Ethane
- Ethene
- Alkalinity
- Chloride
- Total Residual Chloride
- Nitrate and Nitrite as Nitrogen
- Nitrogen, Nitrate
- Sulfate
- Sulfide
- Surfactants
- TOCs
- Manganese
- DO
- Iron II
- Hydrogen
- pH
- ORP

We anticipate that the natural attenuation parameter testing will be infrequent due to the long time frame required for MNA to reduce concentrations near the former source area at the Property.

6.4 Health and Safety

A copy of GEI's site-specific HASP for its employees is in Appendix C. The HASP includes health and safety procedures commensurate with the degree and nature of the risks posed to GEI personnel while conducting the MNA program activities at the Site.

6.5 Reporting

The results of the groundwater testing, and other data collected as part of the MNA program, will be reported to DEP in semi-annual Phase IV RMRs. The RMRs will also document modifications, if necessary, to the MNA program.

6.6 Permits and Access

GEI will obtain permission as necessary from property owners, including the City, to access properties to perform the work associated with the MNA program, and will provide property owners DEP's pre-sampling notification form (BWSC-123) in accordance with the MCP. In accordance with MCP requirements, we will provide property owners with a copy of the laboratory testing results of samples collected on their property and a BWSC-123 form.

Copies of the result letters will be provided to DEP at the time they are mailed to the property owners.

7. Health and Safety Plan (310 CMR 40.0874(3)(e))

GEI prepared a site-specific HASP that includes health and safety procedures commensurate with the degree and nature of the risks posed to GEI personnel during construction, operation, and maintenance of the existing and proposed remedial systems and during monitoring activities at the Site. The HASP is provided in Appendix C.

8. Permits/Access Issues

8.1 Required Permits (310 CMR 40.0874(3)(f))

The City requires Option 1 EPEM (SSDS) installations to be conducted under an electrical permit. Option 2 and 3 EPEMs require a building permit granted by the City's Inspection Services Division. The building permit plans are prepared by GEI and stamped by a Civil Engineer licensed in Massachusetts. The EPEMs are installed under the direction of a Construction Supervisor licensed in Massachusetts. EPEM installations that require structural modifications to a building are conducted in accordance with plans developed by a Structural Engineer licensed in Massachusetts.

8.2 Property Access Issues (310 CMR 40.0874(3)(g))

Property access issues include reaching agreement on terms of access to conduct sampling and mitigation and making contact with absentee property owners. Some property owners have either not executed access agreements or refused to allow sampling or mitigation work.

The plan to resolve access issues entails continuing to educate property owners about the need for sampling and mitigation, meeting with property owners to explain the mitigation process, and working with property owners and other stakeholders to facilitate access.

After multiple attempts to gain access to certain properties, GEI issues "final attempt" letters to property owners who have refused access. We understand that DEP will follow up with these property owners to attempt to gain access.

9. Schedule

UniFirst and GEI will continue to evaluate and mitigate properties under Phase IV and anticipate that mitigation will extend into 2010. There will likely be some property owners that continue to refuse access for sampling or mitigation. The timetable for implementation of a permanent solution for the Site is estimated to be more than 100 years.

10. Limitations

This report was prepared for the use of UniFirst Corporation, exclusively. The conclusions presented in this report are based solely on the information reported in this document. Additional quantitative information regarding the Property and the Site not available to us may result in a modification of the findings herein. The submittal has been prepared in accordance with generally accepted geohydrological practices. No warranty, expressed or implied, is made.

11. References

DEP (1994). “Off-gas Treatment of Point-Source Remedial Air Emissions,” Massachusetts Department of Environmental Protection, Policy #WSC-94-150, dated 1994.

DEP (1995). “Guideline for the Design, Installation, and Operation of Sub-slab Depressurization Systems,” Massachusetts Department of Environmental Protection , Internal Guidance, dated December 1995.

GEI (2006). IRA Status Report No. 1, 50 Tufts Street, Somerville, MA, RTNs 3-23246, 3-24358 and 3-24376, dated May 8, 2006.

GEI (2006). IRA Status Report No. 2 and Plan Modification No. 3, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 13, 2006.

GEI (2007). IRA Plan Modification No. 4, 50 Tufts Street, Somerville, MA, RTNs 3-23246 and 3-26114, dated February 22, 2007.

GEI (2007). IRA Plan Modification No. 1, 50 Tufts Street, Somerville, MA, RTN 3-26114, dated April 12, 2007.

GEI (2007). IRA Plan Modification No. 5, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated May 5, 2007.

GEI (2007). IRA Status Report No. 3, 50 Tufts Street, Somerville, MA, RTN 3-23246 & IRA Status Report No. 1 RTN 3-26114, dated May 10, 2007.

GEI (2007). Remedial Monitoring Report No. 1, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated August 30, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 2, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated August 30 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 3, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated August 30, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 4, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated August 30, 2007.

GEI (2007). IRA Plan Modification No. 7, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated October 11, 2007.

GEI (2007). IRA Plan Modification No. 8, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated October 11, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 5, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated October 19, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 6A, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated October 31, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 6B, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 8, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 7A, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 8, 2007.

GEI (2007). Monthly Remedial Monitoring Report No. 7B, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 8, 2007.

GEI (2007). IRA Status Report No. 4, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 9, 2007.

GEI (2008). IRA Status Report No. 5 and RMR No. 8, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated May 12, 2008.

GEI (2008). Phase II Comprehensive Site Assessment (CSA), Method 3 Risk Characterization, and Phase III Remedial Action Plan (RAP), 50 Tufts Street, Somerville, MA, RTN 3-23246, dated July 14, 2008.

GEI (2008). IRA Status Report No. 6 and RMR No. 9, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated November 10, 2008.

GEI (2009). IRA Status Report No. 7 and RMR No. 10, 50 Tufts Street, Somerville, MA, RTN 3-23246, dated May 11, 2009.

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Geotechnical
Environmental
Water Resources
Ecological

Table 1
Exposure Pathway Elimination Measure (EPEM) Status
Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

Property Address	EPEM Design Option (a)	Date Completed or Last Modified	Date of Last Indoor Air Monitoring	Construction Details									
				Ventilation Fan(s) (Model No.) (b)	Number of Sub-Slab Vapor Extraction Points (SSDS)	Sub-slab Vapor Barrier - HDPE Liner	Sub-Slab Ventilation System - Geocomposite	Sub-Slab Vapor Trench	Foundation Wall Ventilation System - Geocomposite	New Basement Slab Installed	Crawlspace Vapor Barrier	Epoxy Vapor Barrier - Floor	Epoxy Vapor Barrier - Foundation Walls
16-20 Alston Street (d)	Proposed	NA	8/10/2007	-	-	-	-	-	-	-	-	-	-
91-93 Franklin Street	3	March, 2009	4/8/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
95 Franklin Street (c)	1	May, 2007	6/7/2007	GP-501	4	-	-	-	-	-	-	-	-
95R Franklin Street	2	December, 2007	4/3/2009	-	-	-	-	Yes	Yes	-	Yes	Yes	Yes
150 Glen Street	1	February, 2007	3/2/2009	Regenerative Blower	18	-	-	-	-	-	-	-	-
162-164 Glen Street (d)	Proposed	NA	8/13/2007	-	-	-	-	-	-	-	-	-	-
166-168 Glen Street (d)	Proposed	NA	9/7/2007	-	-	-	-	-	-	-	-	-	-
9 Knowlton Street (d)	Proposed	NA	5/21/2007	-	-	-	-	-	-	-	-	-	-
13 Knowlton Street (d)	Proposed	NA	11/7/2007	-	-	-	-	-	-	-	-	-	-
17 Knowlton Street	3	March, 2009	6/5/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
31-33 Knowlton Street	1	February, 2008	1/19/2009	HS-5000	7	-	-	-	-	-	-	-	-
32 Knowlton Street	3	In Progress	1/16/2009	-	-	-	-	-	-	-	-	-	-
35-37 Knowlton Street (c)	3	December, 2008	3/5/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
4 Morton Street (c)	3	November, 2008	3/7/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
10 Morton Street	3	March, 2009	4/3/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
11 Morton Street	2	November, 2008	1/21/2009	-	-	-	-	Yes	Yes	-	-	Yes	Yes
12 Morton Street	3	March, 2008	4/3/2009	-	-	Yes	Yes	-	-	Yes	-	Yes	Yes
13 Morton Street	1	October, 2008	1/21/2009	GP-501	5	-	-	-	-	-	-	-	-
18 Morton Street	1	July, 2007	1/17/2009	GP-501	5	-	-	-	-	-	-	-	-
19-19A Morton Street	3	In Progress	1/13/2009	-	-	-	-	-	-	-	-	-	-
9 Tufts Street (d)	Proposed	NA	12/15/2006	-	-	-	-	-	-	-	-	-	-
11-13 Tufts Street (d)	Proposed	NA	12/15/2006	-	-	-	-	-	-	-	-	-	-
17 Tufts Street (d)	Proposed	NA	12/18/2006	-	-	-	-	-	-	-	-	-	-
19 Tufts Street (d)	Proposed	NA	12/15/2006	-	-	-	-	-	-	-	-	-	-
23 Tufts Street	1	May, 2007	1/14/2009	GP-501	1	-	-	-	-	-	-	-	-
25 Tufts Street (d)	Proposed	NA	12/15/2006	-	-	-	-	-	-	-	-	-	-
27 Tufts Street	3	February, 2009	3/4/2009	-	-	Yes	Yes	-	-	Yes	Yes	Yes	Yes
50 Tufts Street		August, 2007	3/9/2009	Regenerative Blower	22								
60 Tufts Street	1	April, 2009	6/5/2009	Regenerative Blower	14								
103 Washington Street	1	July, 2007	NS	GP-501 and GP-201	3	-	-	-	-	-	-	-	-
105-107 Washington Street (d)	Proposed	NA	2/20/2009	-	-	-	-	-	-	-	-	-	-
111 Washington Street (d)	Proposed	NA	6/30/2009	-	-	-	-	-	-	-	-	-	-

General Notes:
1. NS = Not sampled.
2. NA = Not Applicable.

Footnotes:
(a) Typical design details for system components are show in Figs. 5 through 7.
(b) Ventilation fans manufactured by Radon Away.
(c) EPEM modifications in progress.
(d) EPEM Installation and/or testing refused

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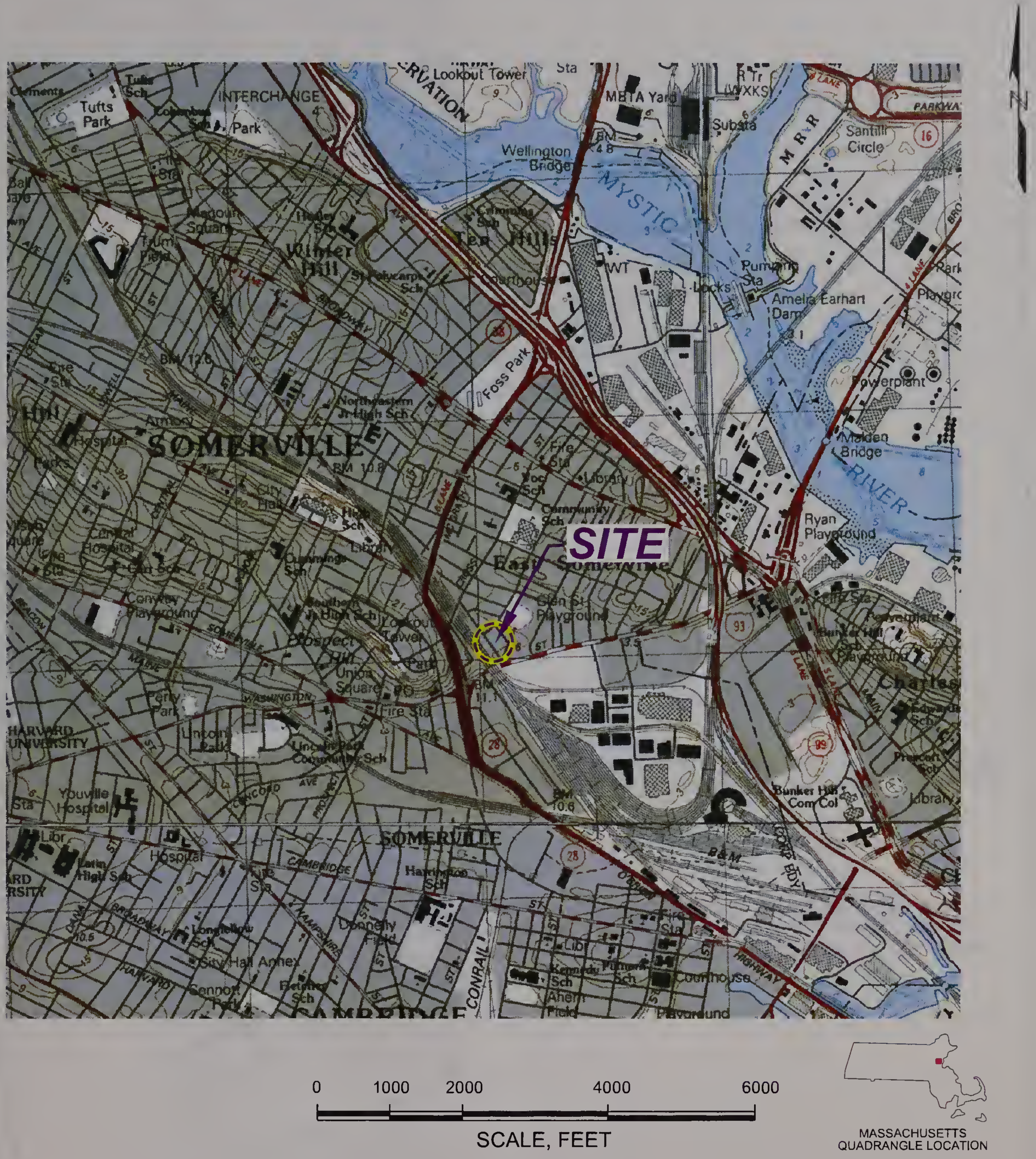

This Image provided by MassGIS is taken from
U.S.G.S. Topographic 7.5 X 15 Minute Series
Boston North, MA Quadrangle, 1985.
Datum is National Geodetic Vertical Datum (NGVD 1929).
Contour Interval is 3 Meters.

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

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SITE LOCATION MAP

Project 04516-3

August 2009

Fig. 1

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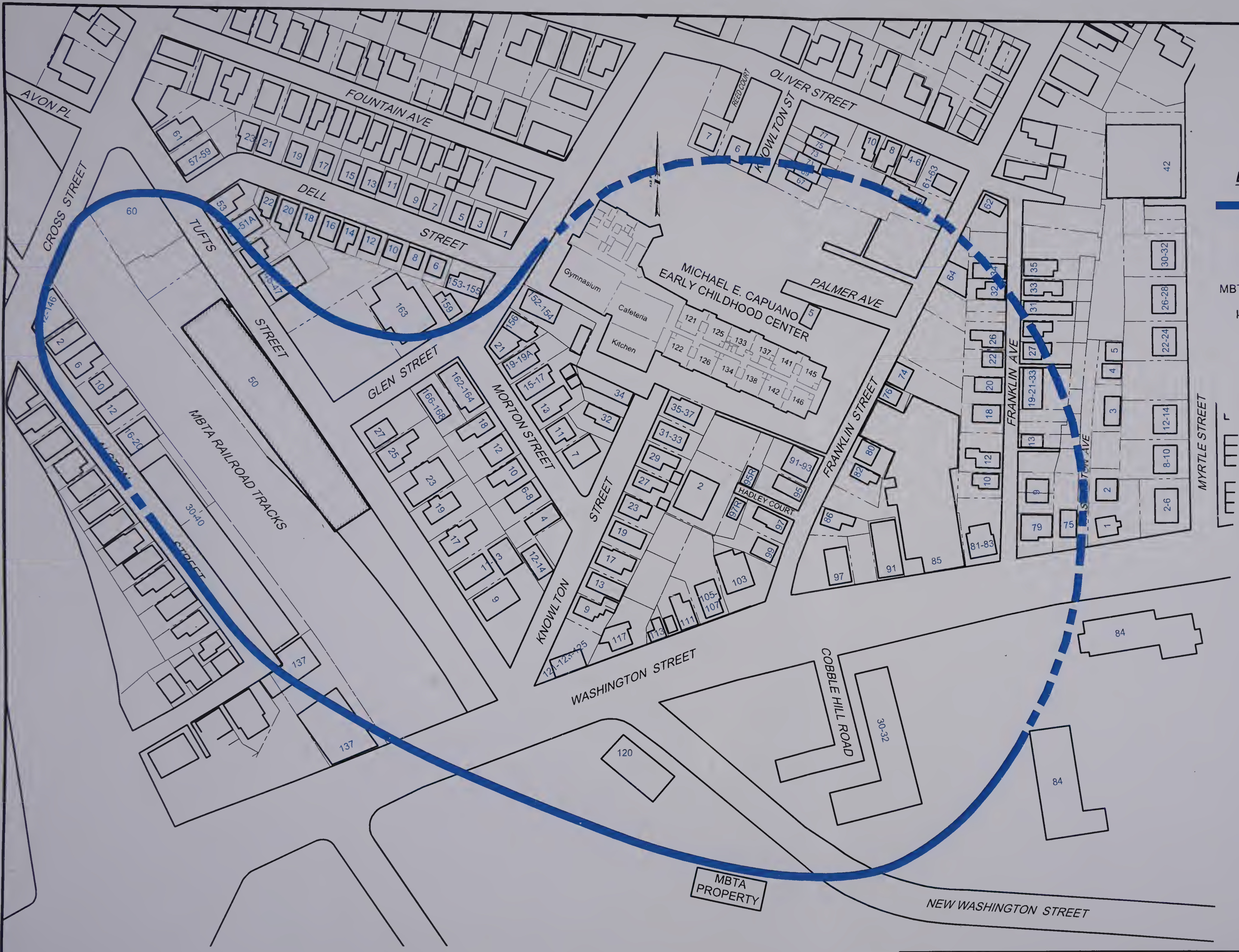

0 150 300

APPROXIMATE SCALE, FEET

LEGEND:

▬ DISPOSAL SITE BOUNDARY (DASHED WHERE INFERRED)

138 ROOM NUMBER AT CAPUANO SCHOOL

84 STREET ADDRESS

MBTA = MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

μg/l = MICROGRAMS PER LITER

GENERAL NOTES:

1. HORIZONTAL CONTROL FOR THIS PLAN WAS ESTABLISHED BY GPS AND IS BASED ON THE NORTH AMERICAN DATUM OF 1983.
2. STREET AND PROPERTY LINES BASED ON SOMERVILLE ASSESSORS' MAPS AND ARE BEST FIT RELATIVE TO THE LOCATION OF THE 50 TUFTS ST. BUILDING.
3. THE DISPOSAL SITE BOUNDARY LINE IS BASED ON GROUNDWATER ANALYTICAL RESULTS PRESENTED IN THE PHASE II COMPREHENSIVE SITE ASSESSMENT (JULY 16, 2008).

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts
UniFirst Corporation
Wilmington, Massachusetts

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Project 04516-3

SITE AREA
AND APPROXIMATE
SITE BOUNDARY

August 2009

Fig. 2

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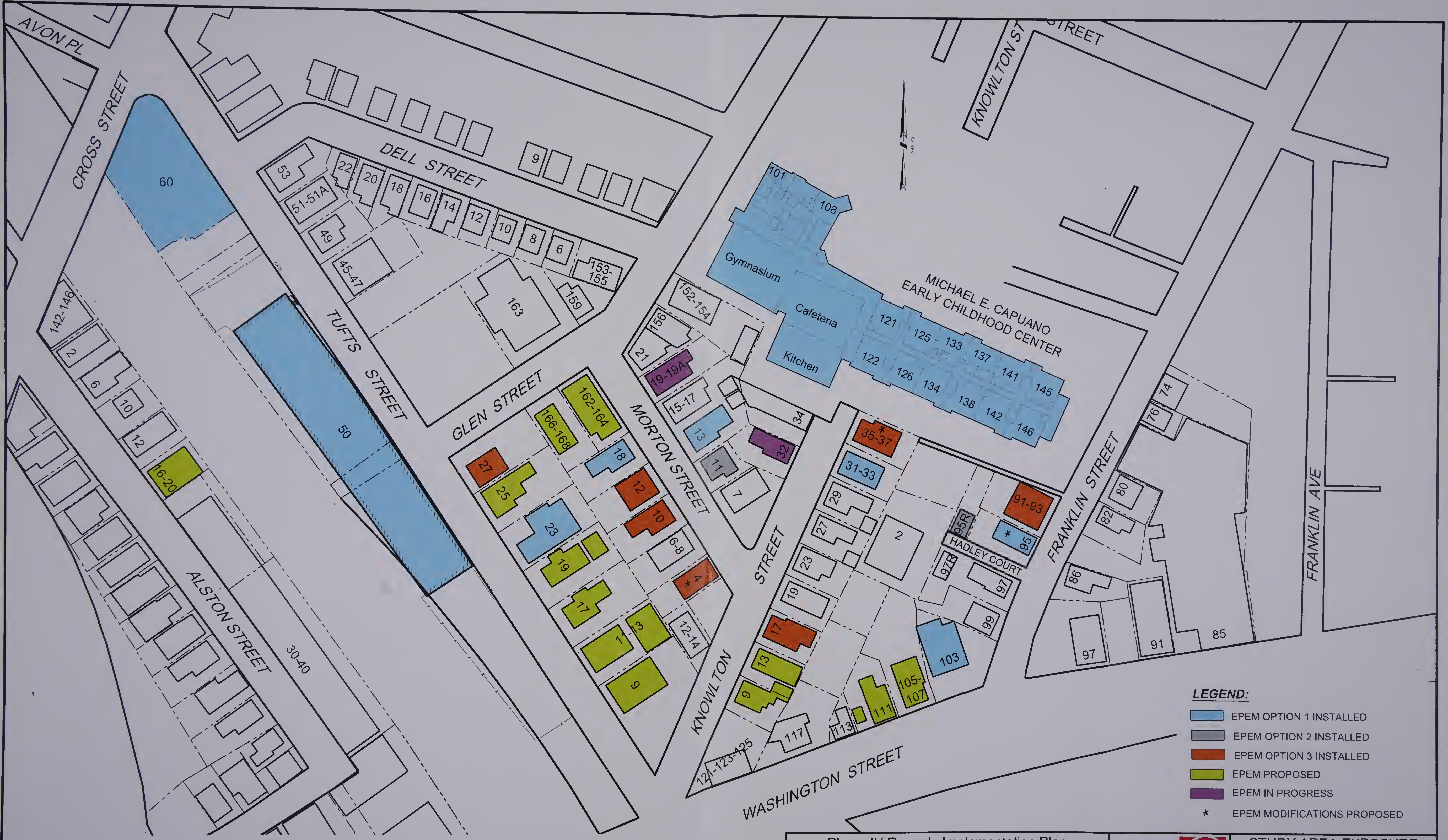

LEGEND:

- 🟦 EPEM OPTION 1 INSTALLED
- ▨ EPEM OPTION 2 INSTALLED
- 🟧 EPEM OPTION 3 INSTALLED
- 🟩 EPEM PROPOSED
- 🟪 EPEM IN PROGRESS
- * EPEM MODIFICATIONS PROPOSED

0 100 200
SCALE, FEET

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

Project 04516-3

STUDY AREA EXPOSURE PATHWAY ELIMINATION MEASURE (EPEM) PROGRESS

August 2009

Fig. 3

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Preferred Criteria for:

Option 1 (SSDS):

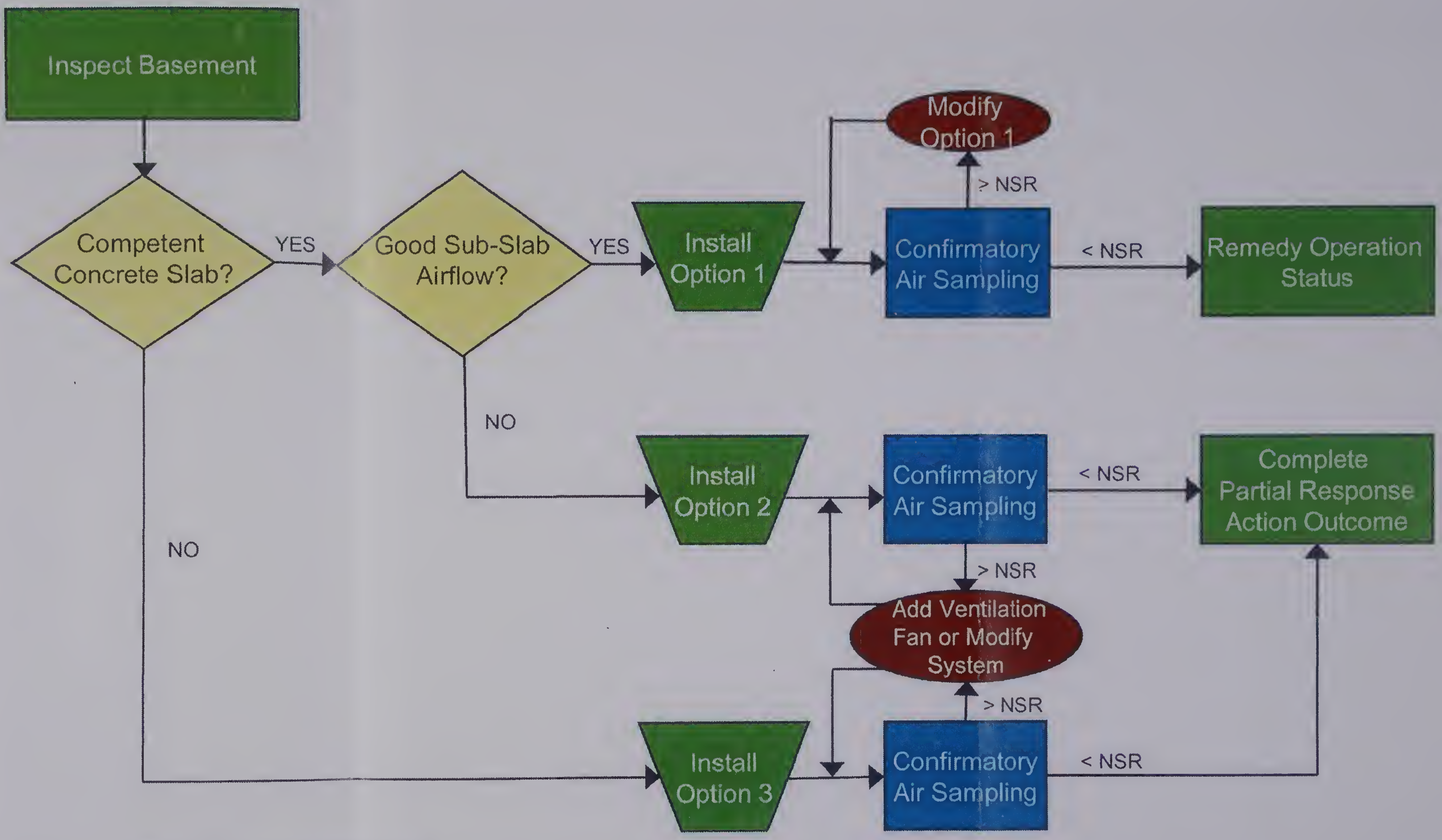
1. Competent concrete slab
2. Poured concrete foundation
3. Granular sub-grade (good sub-slab air flow)

Option 2 (Vapor Trench):

1. Competent concrete slab
2. Silt /clay sub-grade (poor sub-slab air flow).

Option 3 (New Slab Installation):

1. Incompetent concrete slab
2. Silt/clay sub-grade (poor sub-slab air flow)



NSR = No Significant Risk

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

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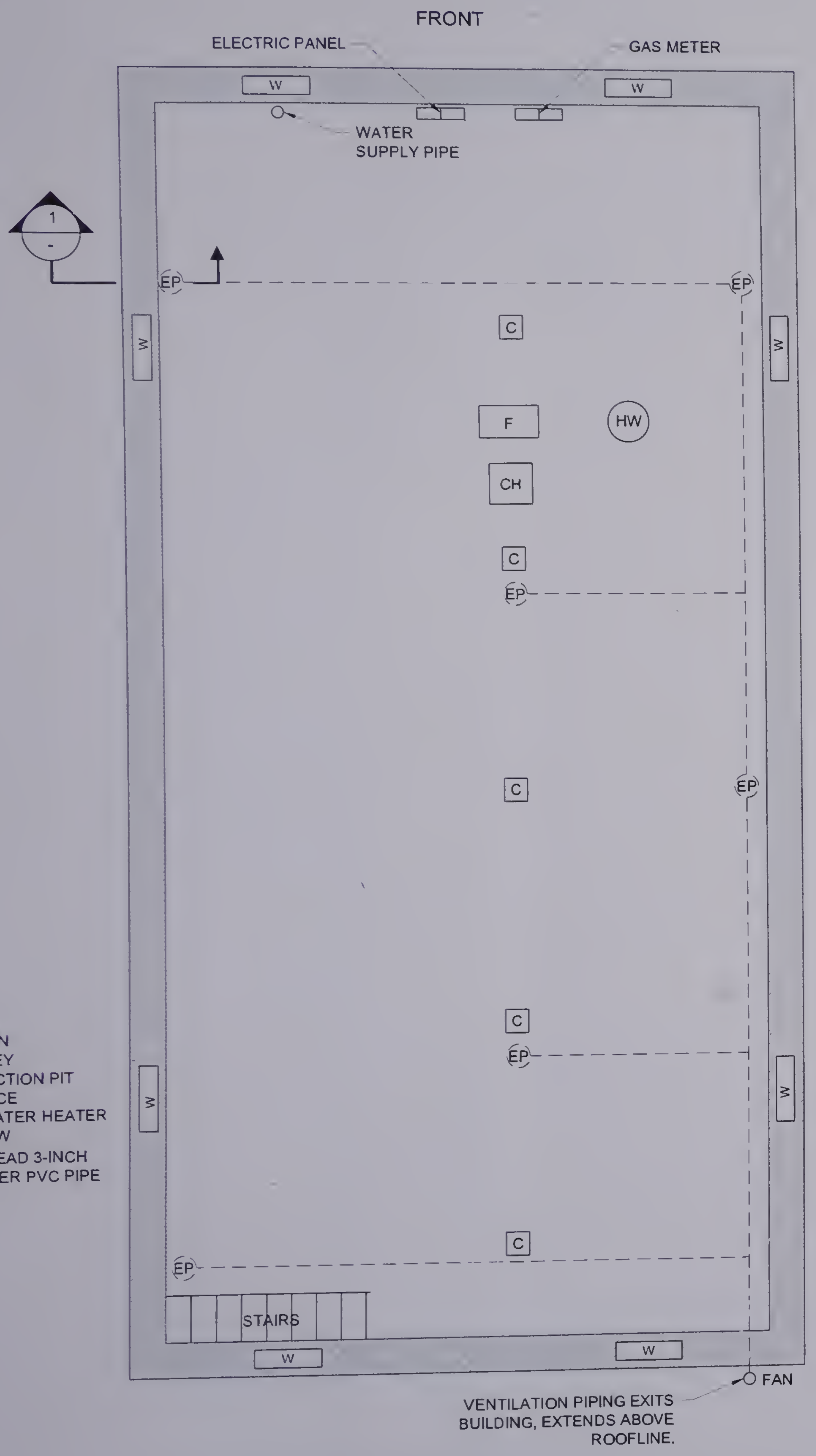
Project 04516-3

EPEM MITIGATION
FLOW CHART

August 2009

Fig. 4

N:\04516\#Drafting\04516-3\Phase IV Report\045163- Phase IV-4

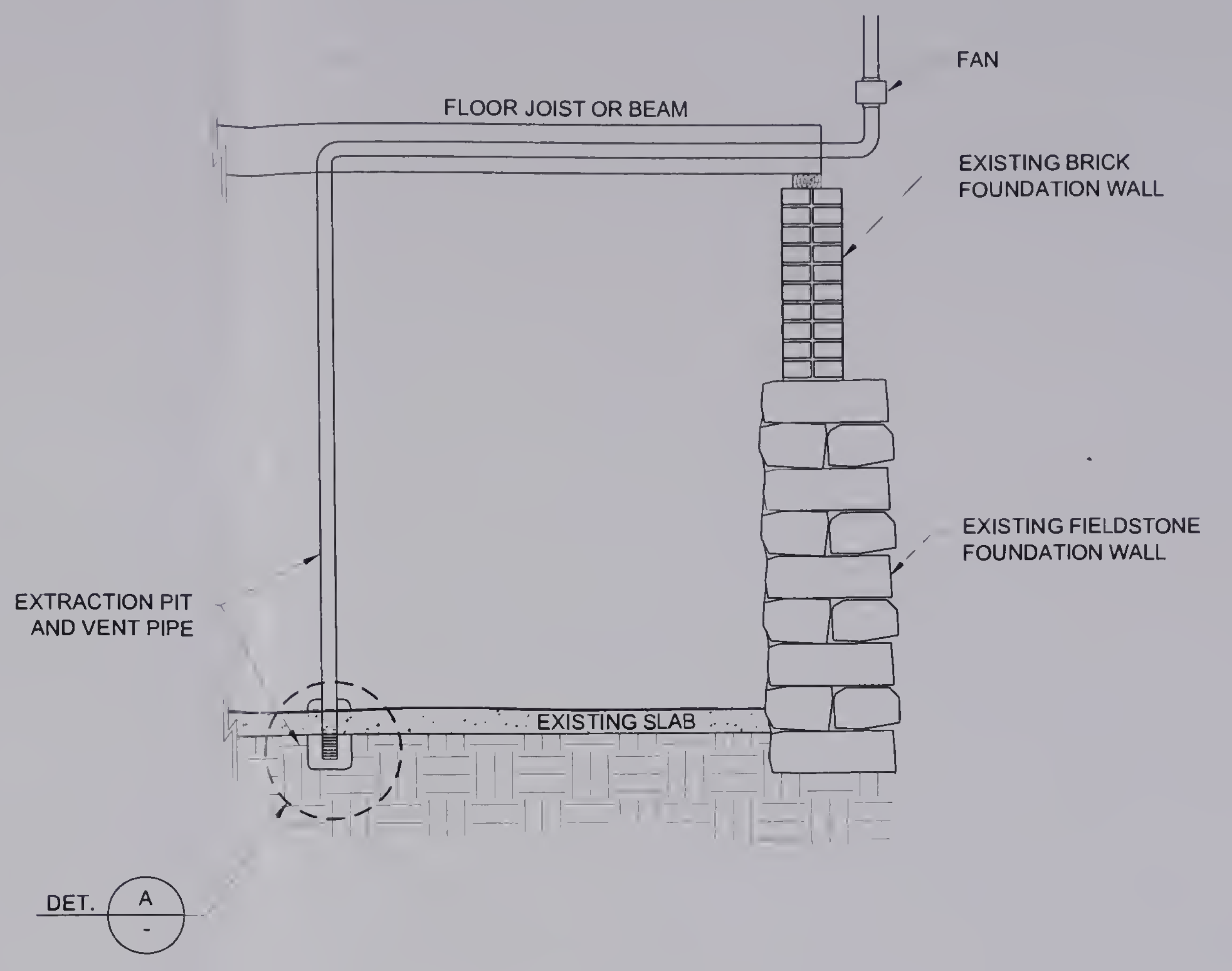


LEGEND:

C: COLUMN
CH: CHIMNEY
EP: EXTRACTION PIT
F: FURNACE
HW: HOT WATER HEATER
W: WINDOW
╎ : OVERHEAD 3-INCH DIAMETER PVC PIPE

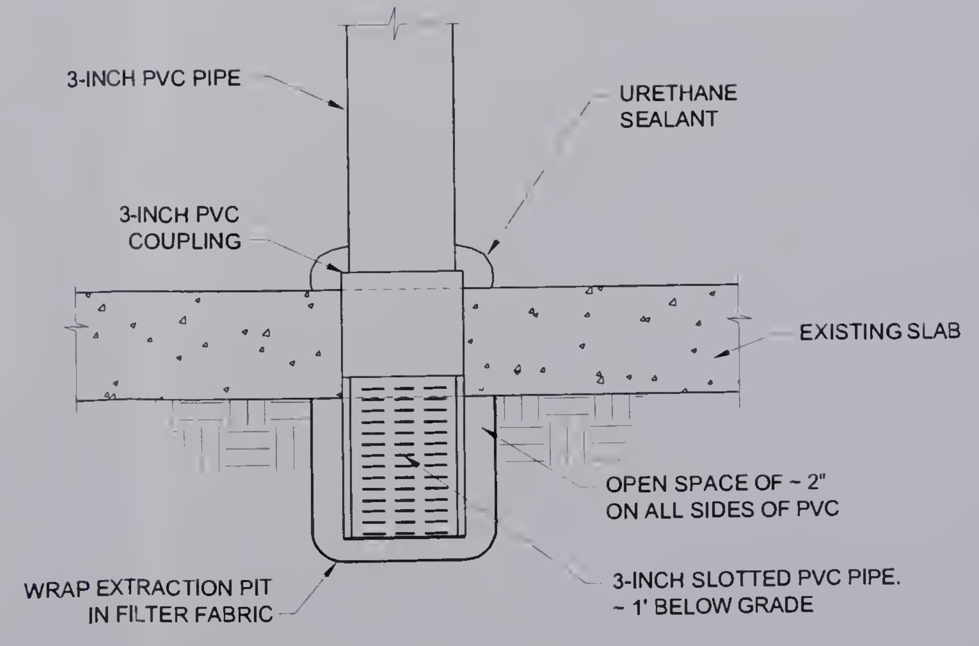
BASEMENT

NOT TO SCALE


FAN
FLOOR JOIST OR BEAM
EXISTING BRICK FOUNDATION WALL
EXISTING FIELDSTONE FOUNDATION WALL
EXTRACTION PIT AND VENT PIPE
EXISTING SLAB
DET. A -

SECTION 1 -

NOT TO SCALE


3-INCH PVC PIPE
URETHANE SEALANT
3-INCH PVC COUPLING
EXISTING SLAB
OPEN SPACE OF ~ 2" ON ALL SIDES OF PVC
WRAP EXTRACTION PIT IN FILTER FABRIC
3-INCH SLOTTED PVC PIPE. ~ 1' BELOW GRADE

DETAIL - VENT PIPE
PENETRATION THRU BASEMENT FLOOR SLAB A -

EXTRACTION PIT

NOT TO SCALE

SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE
4) URETHANE SEALANT
5) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION

NOTES:

1. DRAWINGS AND SPECIFICATIONS SHOWN HERE ARE FOR CONCEPTUAL DESIGN PURPOSES ONLY. ACTUAL DESIGN DETAILS AND SPECIFICATIONS SHOULD BE DETERMINED BASED ON FIELD CONDITIONS.

2. BASEMENT COMPONENTS SHOWN HERE SUCH AS FURNACES, BULKHEADS, HOT WATER HEATERS, ETC. MAY NOT BE PRESENT AT ALL BASEMENTS.

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

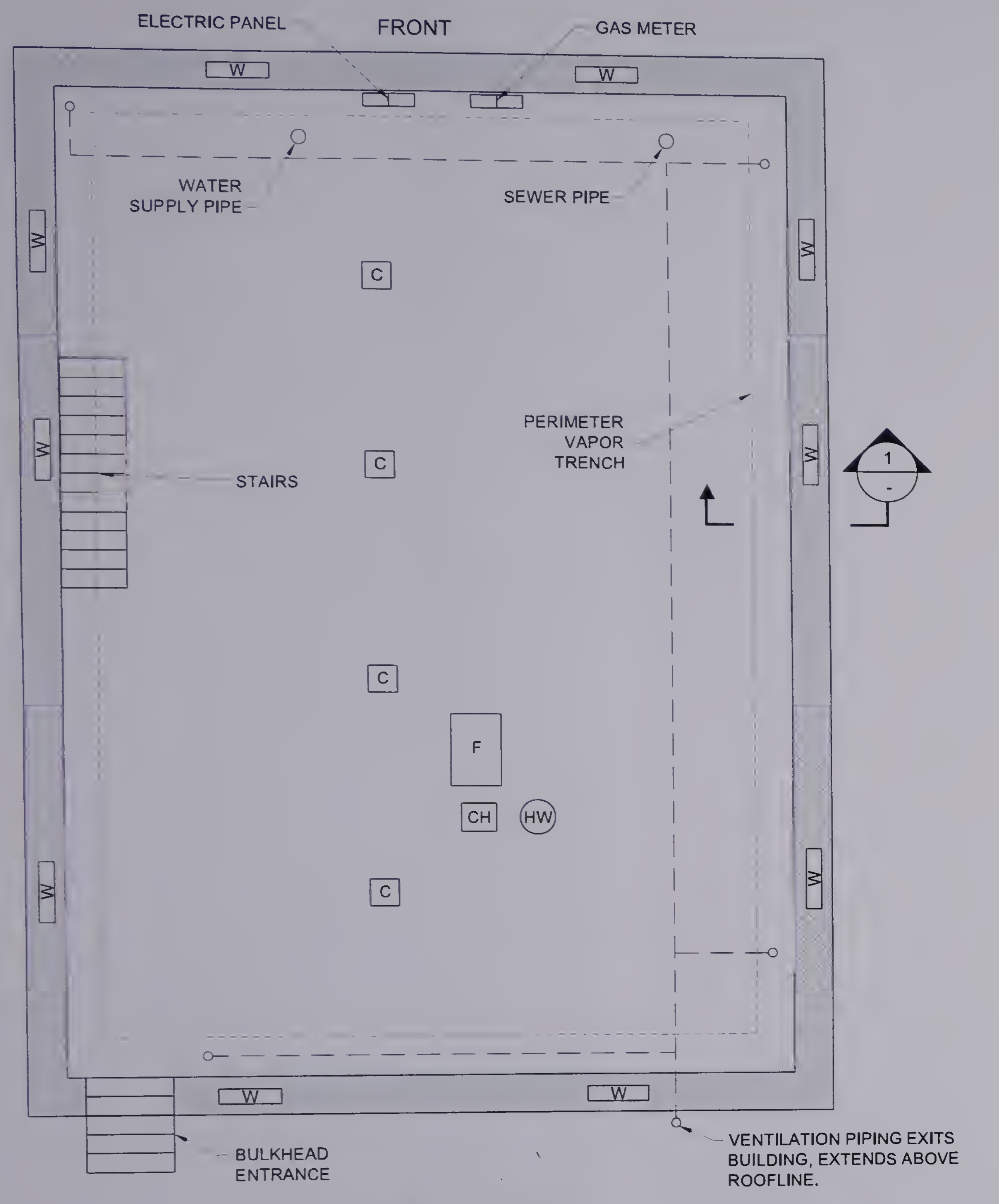
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

EXPOSURE PATHWAY
ELIMINATION MEASURE
OPTION 1 SCHEMATIC

Project 04516-3 | August 2009 | Fig. 5

N:\04516\#Drafting\04516-3\Phase IV Report\EPEM Option 1

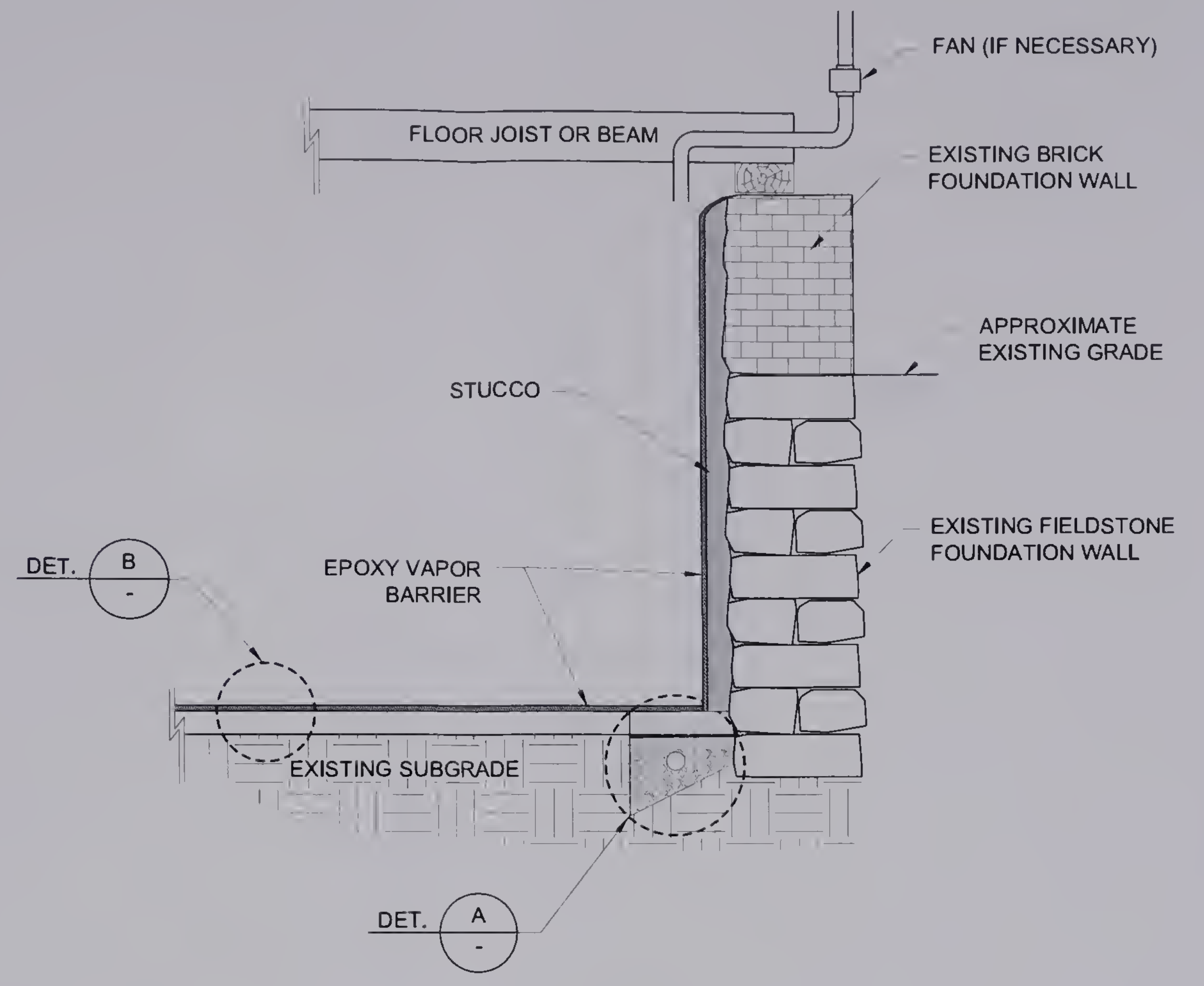


BASEMENT PLAN

NOT TO SCALE

LEGEND

C = COLUMN
F = FURNACE
CH = CHIMNEY
HW = WATER HEATER
W = WINDOW AT TOP OF WALL
— — — = OVERHEAD 3-INCH DIAMETER PVC PIPE



SECTION 1 -

NOT TO SCALE

SPECIFICATIONS:

1) CONCRETE: IN ACCORDANCE WITH ACI 301 "SPECIFICATION FOR STRUCTURAL CONCRETE."
   A) MINIMUM COMPRESSIVE STRENGTH (F'C) (ASTM C39): 3000 PSI @ 28 DAYS.
   B) PORTLAND CEMENT (ASTM C150): TYPE II OR IIA.
   C) MAXIMUM WATER-TO-CEMENT RATIO BY WEIGHT: 0.50.
   D) AGGREGATE (ASTM C33): 3/4-INCH NOMINAL MAXIMUM SIZE.
   E) SLUMP (ASTM C143): 3 INCHES TO 5 INCHES.
   F) AIR CONTENT: 7.0%, +/- 1.5%.
   G) PERMITTED ADMIXTURES: AIR ENTRAINING, FIBER REINFORCEMENT.
2) CONCRETE FINISHING: FLOAT FINISH.
3) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40.
4) PERFORATED PVC PIPE: ASTM D2729.
5) CRUSHED STONE: MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 1988 EDITION, SECTION M2.01.4 (3/4-INCH NOMINAL SIZE); GRADATION RECAPITULATED BELOW:

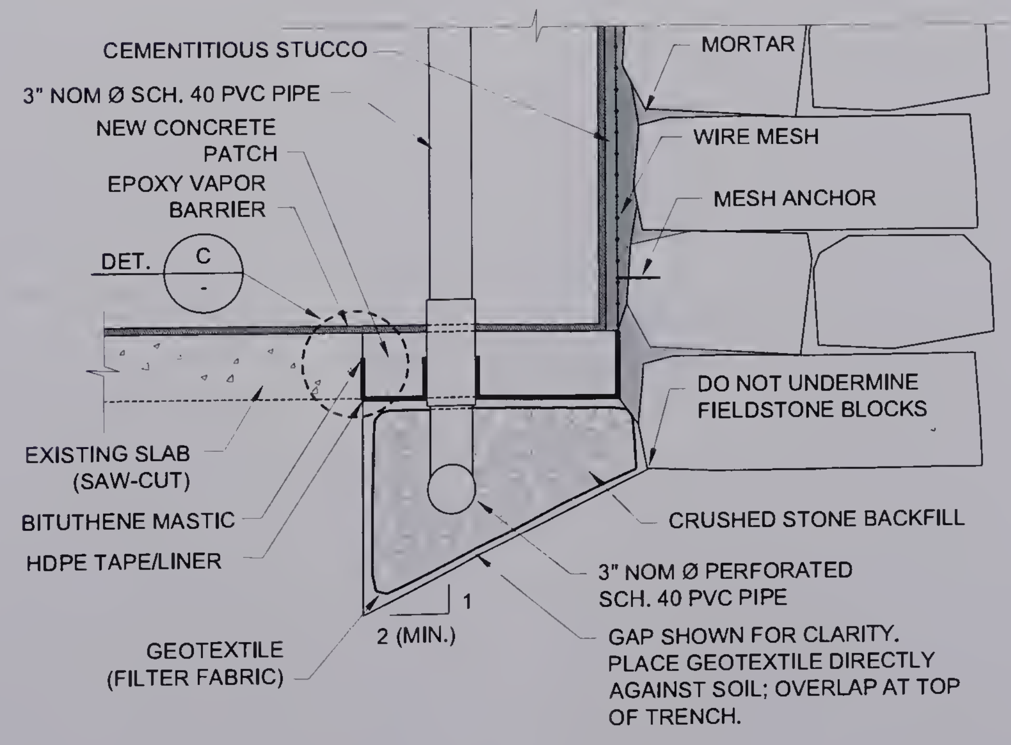
SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 INCH	100
¾ INCH	90-100
½ INCH	10-50
⅜ INCH	0-20
NO. 4	0-5

6) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE.
7) MASTIC: W.R. GRACE & CO. BITUTHENE MASTIC.
8) WIRE MESH ANCHORED VIA MASONRY FASTENERS. ANCHORS INSTALLED INTO STONE AND BRICK NOT MORTAR JOINTS.
9) STUCCO: CEMENTITIOUS STUCCO APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. FINISHED TOTAL THICKNESS 1 INCH, ± ⅛ INCH.
10) EPOXY VAPOR BARRIER: SIKAGARD 62.
11) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION.

NOTES:

1. DRAWINGS AND SPECIFICATIONS SHOWN HERE ARE FOR CONCEPTUAL DESIGN PURPOSES ONLY. ACTUAL DESIGN DETAILS AND SPECIFICATIONS WILL BE DETERMINED BASED ON FIELD CONDITIONS.

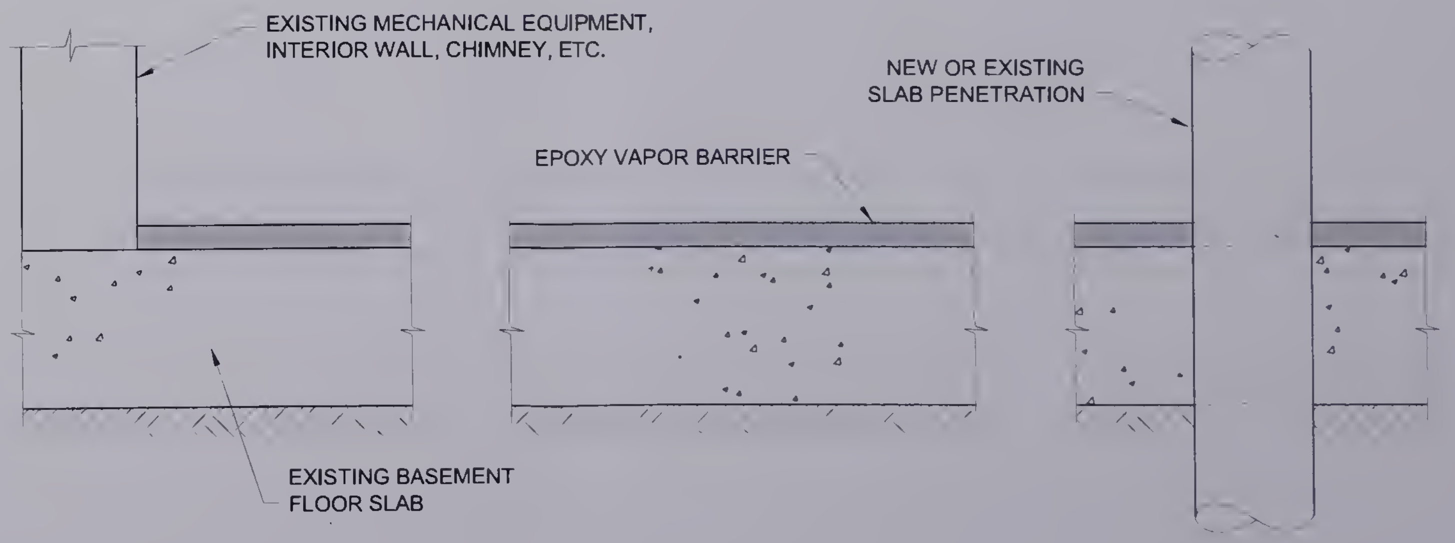
2. BASEMENT COMPONENTS SHOWN HERE SUCH AS FURNACES, HOT WATER HEATERS, ETC. ARE ILLUSTRATIVE AND MAY NOT BE REPRESENTATIVE OF ALL BASEMENTS.


CEMENTITIOUS STUCCO
3" NOM Ø SCH. 40 PVC PIPE
NEW CONCRETE PATCH
EPOXY VAPOR BARRIER
DET. C -
EXISTING SLAB (SAW-CUT)
BITUTHENE MASTIC
HDPE TAPE/LINER
GEOTEXTILE (FILTER FABRIC)
2 (MIN.)
1
MORTAR
WIRE MESH
MESH ANCHOR
DO NOT UNDERMINE FIELDSTONE BLOCKS
CRUSHED STONE BACKFILL
3" NOM Ø PERFORATED SCH. 40 PVC PIPE
GAP SHOWN FOR CLARITY. PLACE GEOTEXTILE DIRECTLY AGAINST SOIL; OVERLAP AT TOP OF TRENCH.

DETAIL A -

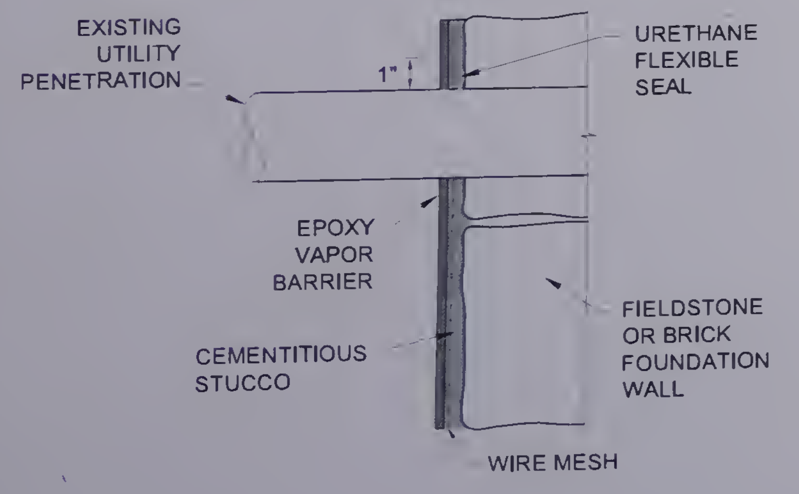
PERIMETER VAPOR TRENCH

NOT TO SCALE


EXISTING MECHANICAL EQUIPMENT, INTERIOR WALL, CHIMNEY, ETC.
NEW OR EXISTING SLAB PENETRATION
EPOXY VAPOR BARRIER
EXISTING BASEMENT FLOOR SLAB

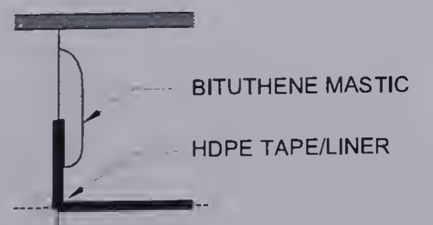
DETAIL - BASEMENT SLAB VAPOR BARRIER SYSTEM B -

NOT TO SCALE



DETAIL - EXISTING UTILITY PENETRATION AT FOUNDATION WALL

NOT TO SCALE



DETAIL C -

HDPE TAPE DETAIL

NOT TO SCALE

Phase IV Remedy Implementation Plan
50 Tufts Street
Somerville, Massachusetts

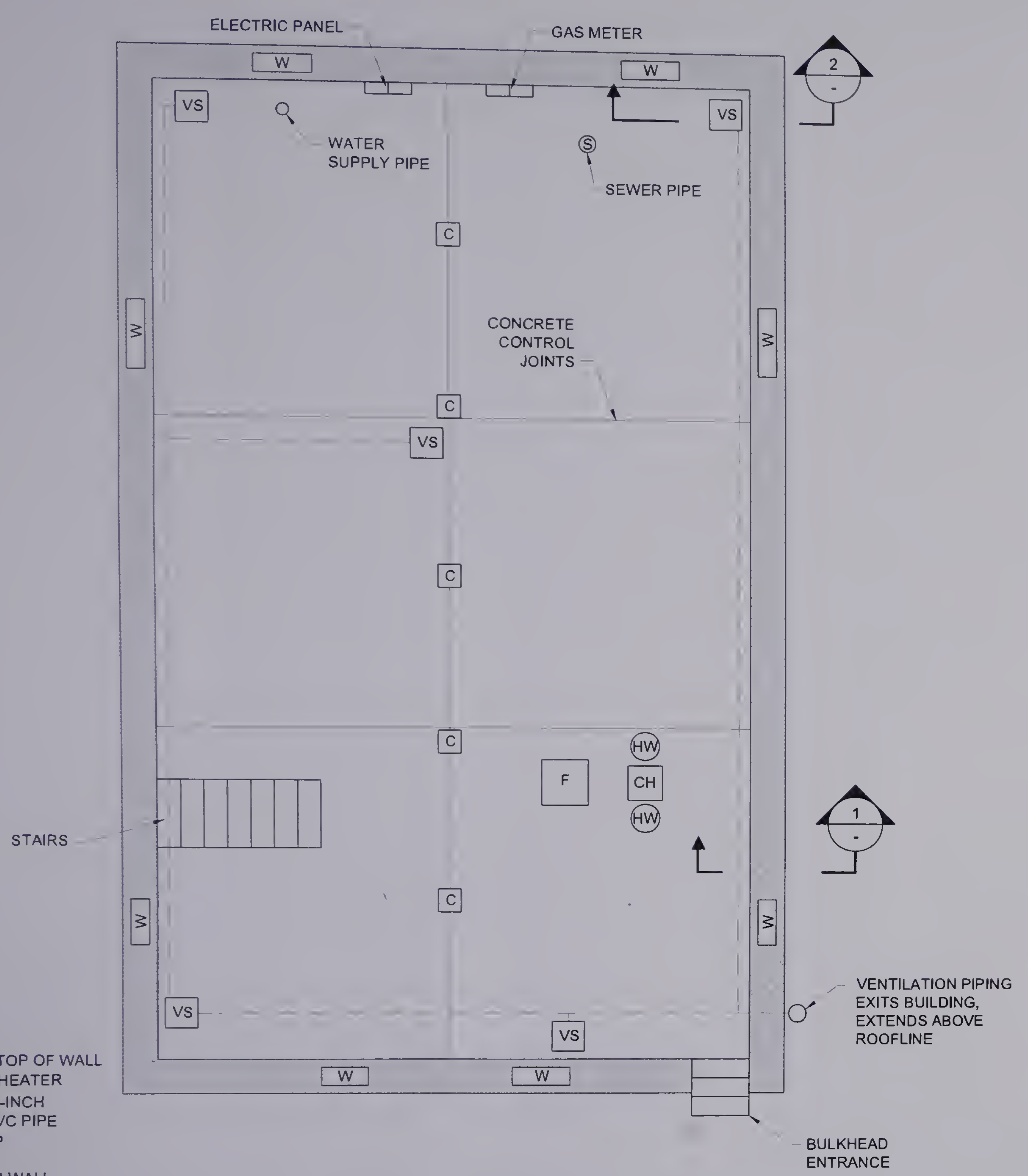
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

EXPOSURE PATHWAY ELIMINATION MEASURE OPTION 2 SCHEMATIC

Project 04516-3 | August 2009 | Fig. 6

N:\04516\#Drafting\04516-3\Phase IV Report\EPEM Option 2

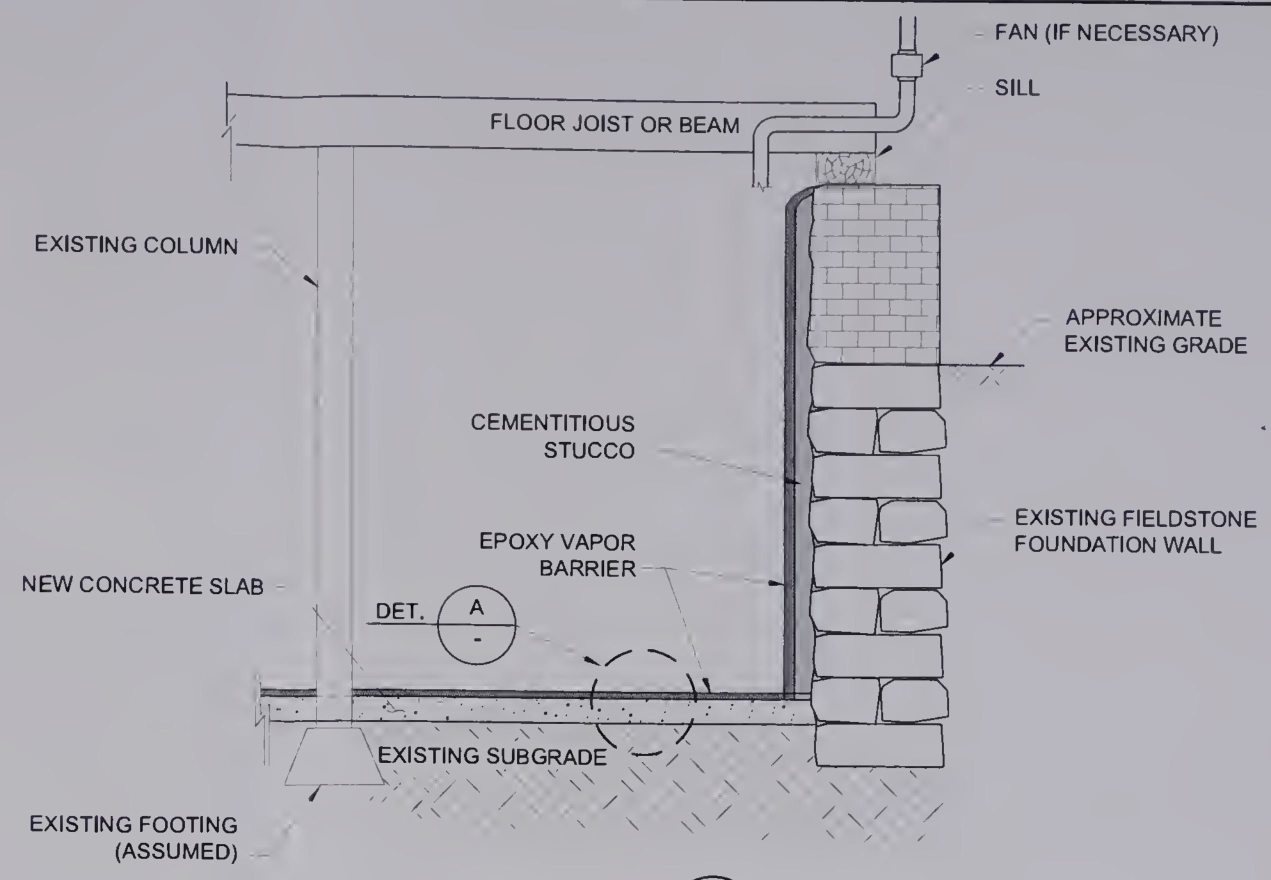


LEGEND:

CH: CHIMNEY
C: COLUMN
F: FURNACE
W: WINDOW AT TOP OF WALL
HW: HOT WATER HEATER
- - - : OVERHEAD 3-INCH DIAMETER PVC PIPE
VS : VAPOR SUMP
▭ : FOUNDATION WALL

BASEMENT PLAN

NOT TO SCALE



SECTION 1 -

NOT TO SCALE

SPECIFICATIONS:

1) CONCRETE: IN ACCORDANCE WITH ACI 301 "SPECIFICATION FOR STRUCTURAL CONCRETE."
   A) MINIMUM COMPRESSIVE STRENGTH (F'C) (ASTM C39): 3000 PSI @ 28 DAYS.
   B) PORTLAND CEMENT (ASTM C150): TYPE II OR IIA.
   C) MAXIMUM WATER-TO-CEMENT RATIO BY WEIGHT: 0.50.
   D) AGGREGATE (ASTM C33): 3/4-INCH NOMINAL MAXIMUM SIZE.
   E) SLUMP (ASTM C143): 3 INCHES TO 5 INCHES.
   F) AIR CONTENT: 7.0%, +/- 1.5%.
   G) PERMITTED ADMIXTURES: AIR ENTRAINING, FIBER REINFORCEMENT.
2) CONCRETE FINISHING: FLOAT FINISH.
3) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40.
4) SLOTTED PVC PIPE: 20 SLOT THREE ROW WELL SCREEN.
5) CRUSHED STONE: MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 1988 EDITION, SECTION M2.01.4 (3/4-INCH NOMINAL SIZE); GRADATION RECAPITULATED BELOW:

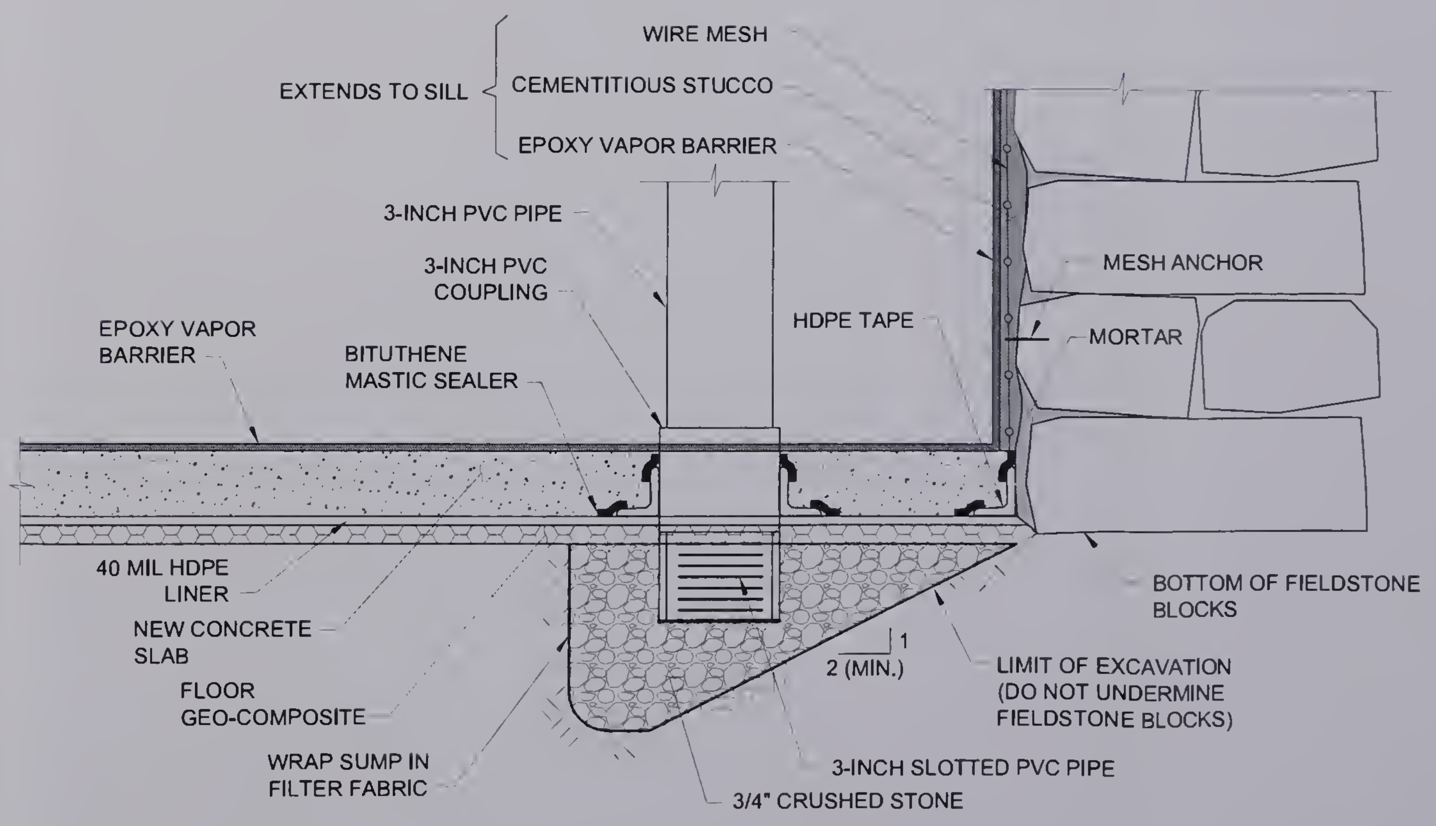
SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 INCH	100
¾ INCH	90-100
½ INCH	10-50
⅜ INCH	0-20
NO. 4	0-50

6) FLOOR GEOCOMPOSITE: TENAX ROCK-IN-ROLL 7100-2 DOUBLE SIDED.
7) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE.
8) MASTIC: W.R. GRACE & CO. BITUTHENE MASTIC.
9) WIRE MESH ANCHORED VIA GALVANIZED MASONRY FASTENERS ON 1.5 FOOT GRID SPACING. ANCHORS INSTALLED INTO STONE NOT MORTAR JOINTS.
10) STUCCO: CEMENTITIOUS STUCCO APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. FINISHED TOTAL THICKNESS 1 INCH, ± ⅛ INCH.
11) EPOXY VAPOR BARRIER: SIKAGARD 62.
12) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION.

NOTES:

1. DRAWINGS AND SPECIFICATIONS SHOWN HERE ARE FOR CONCEPTUAL DESIGN PURPOSES ONLY. ACTUAL DESIGN DETAILS AND SPECIFICATIONS WILL BE DETERMINED BASED ON FIELD CONDITIONS.

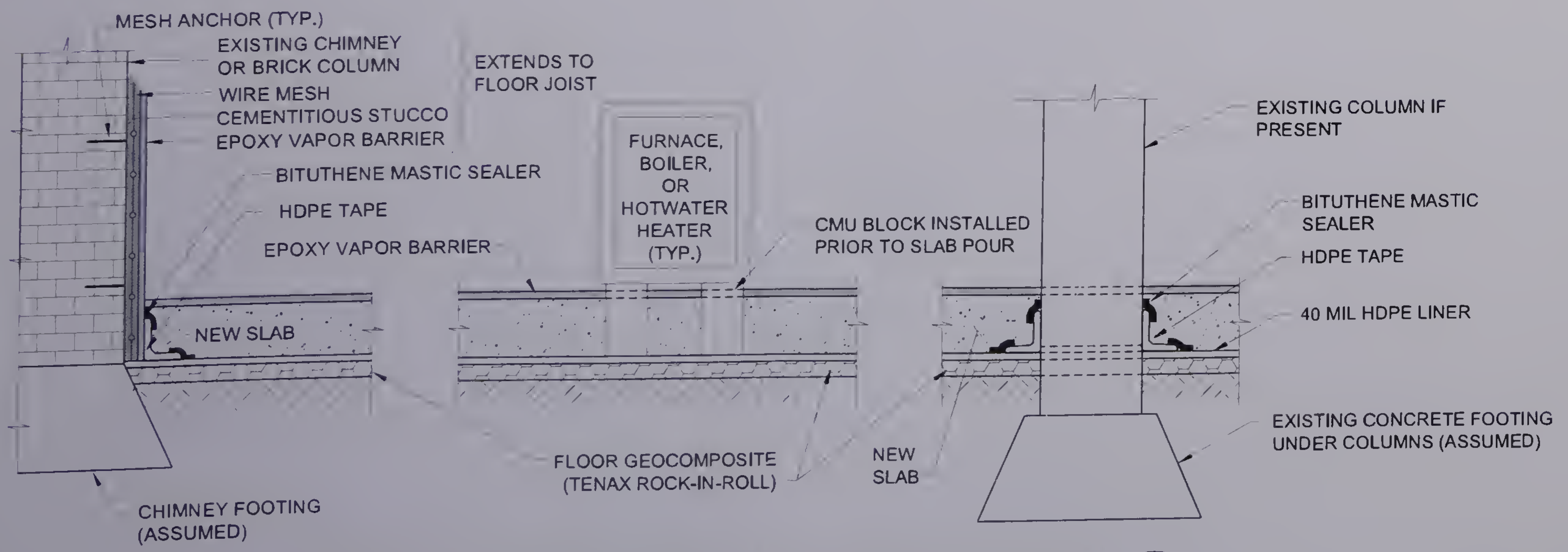
2. BASEMENT COMPONENTS SHOWN HERE SUCH AS FURNACES, HOT WATER HEATERS, ETC. ARE ILLUSTRATIVE AND MAY NOT BE REPRESENTATIVE OF ALL BASEMENTS.



TYPICAL SECTION - VENT PIPE PENETRATION THROUGH NEW BASEMENT FLOOR SLAB 2 -

VAPOR SUMP

NOT TO SCALE


MESH ANCHOR (TYP.)
EXISTING CHIMNEY OR BRICK COLUMN
WIRE MESH
CEMENTITIOUS STUCCO
EPOXY VAPOR BARRIER
EXTENDS TO FLOOR JOIST
BITUTHENE MASTIC SEALER
HDPE TAPE
EPOXY VAPOR BARRIER
NEW SLAB
FURNACE, BOILER, OR HOTWATER HEATER (TYP.)
CMU BLOCK INSTALLED PRIOR TO SLAB POUR
EXISTING COLUMN IF PRESENT
BITUTHENE MASTIC SEALER
HDPE TAPE
40 MIL HDPE LINER
EXISTING CONCRETE FOOTING UNDER COLUMNS (ASSUMED)
FLOOR GEOCOMPOSITE (TENAX ROCK-IN-ROLL)
NEW SLAB
CHIMNEY FOOTING (ASSUMED)

DETAIL - BASEMENT SLAB VAPOR BARRIER SYSTEM A -

NOT TO SCALE

Phase IV Remedy Implementation Plan
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EXPOSURE PATHWAY ELIMINATION MEASURE OPTION 3 SCHEMATIC

Project 04516-3 | August 2009 | Fig. 7

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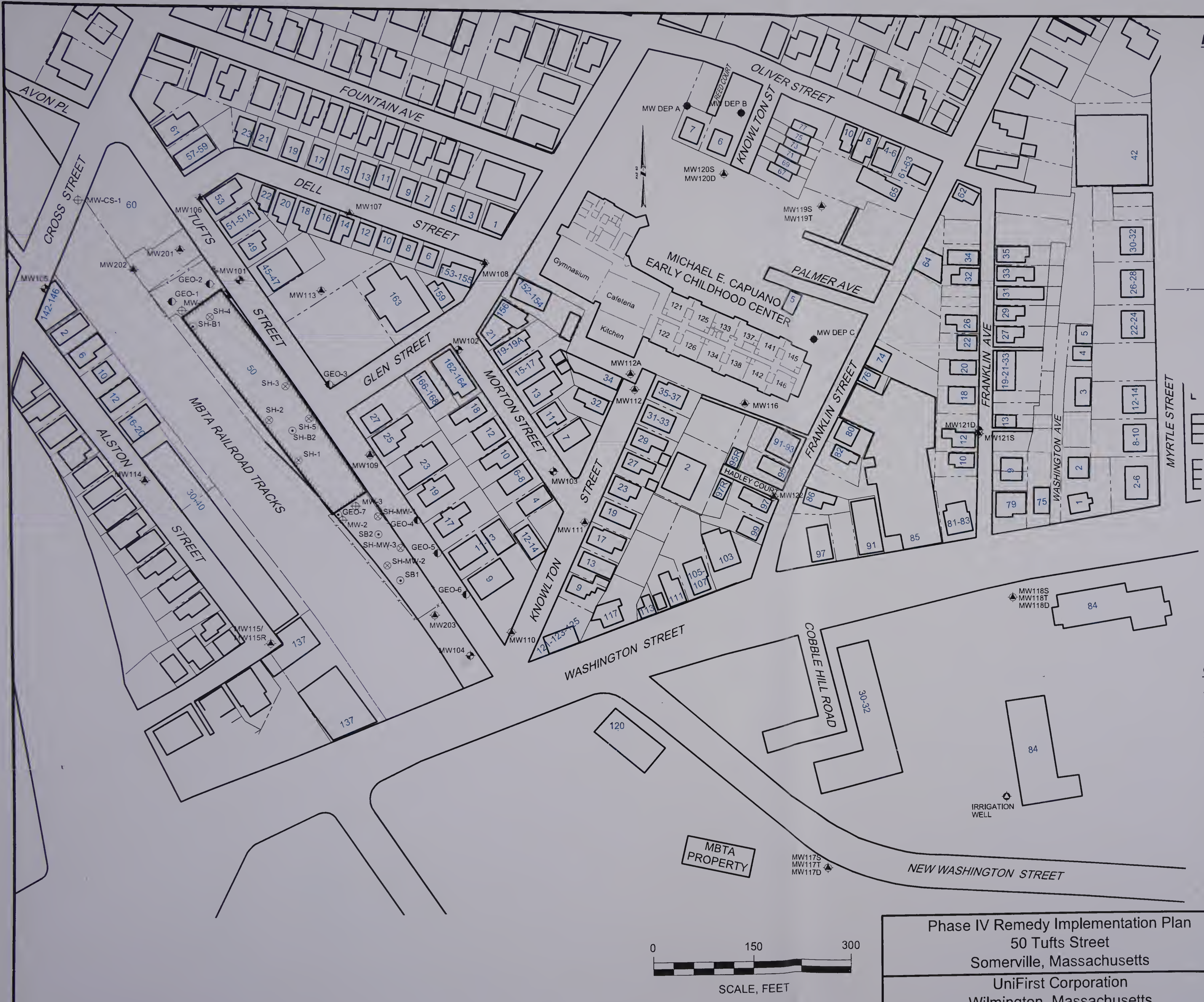

LEGEND:

- ◆ MONITORING WELL WITH SOIL VAPOR SAMPLE PORT INSTALLED BY GEI, JANUARY 2007 - JANUARY 2008
- ⊗ MONITORING WELL INSTALLED BY SANBORN HEAD ASSOCIATES, 2002
- ◐ MONITORING WELL INSTALLED BY GEOINSIGHT, JUNE 2004
- ⊙ SOIL BORING ADVANCED BY GEOINSIGHT, AUGUST 2004
- ⊕ MONITORING WELL INSTALLED BY GEI, MAY 2006
- ● DRIVEN POINT MONITORING WELL INSTALLED BY MADEP, MAY 2007
- ⌖ MONITORING WELL INSTALLED PREVIOUSLY, DATE UNKNOWN
- △ PREVIOUSLY INSTALLED IRRIGATION WELL
- —x—x— CHAIN LINK FENCE
- 138 ROOM NUMBER AT CAPUANO SCHOOL
- 84 STREET ADDRESS

MBTA = MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

GENERAL NOTES:

1. HORIZONTAL CONTROL FOR THIS PLAN WAS ESTABLISHED BY GPS AND IS BASED ON THE NORTH AMERICAN DATUM OF 1983.
2. STREET AND PROPERTY LINES BASED ON SOMERVILLE ASSESSORS' MAPS AND ARE BEST FIT RELATIVE TO THE LOCATION OF THE 50 TUFTS ST. BUILDING.
3. MONITORING WELL LOCATIONS AND ELEVATIONS WERE ESTABLISHED BY ON THE GROUND SURVEYS BY BSC GROUP, INC.
4. GEI OBSERVED ABANDONMENT OF SH-MW1 AND SH-1 THROUGH SH-5 IN 2007.

Phase IV Remedy Implementation Plan
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Wilmington, Massachusetts

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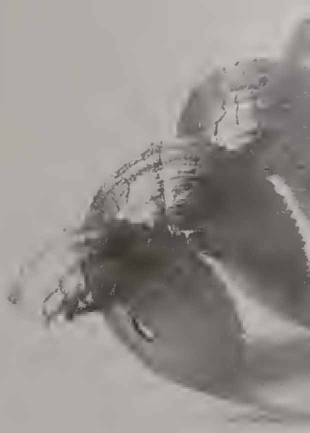
MONITORING WELL AND BORING LOCATIONS

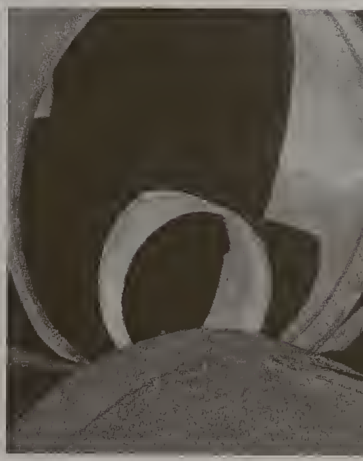
Project 04516-3
August 2009
Fig. 8

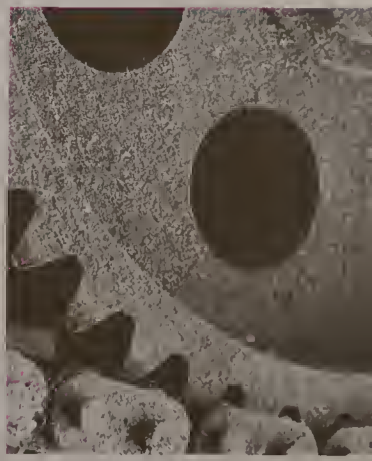
N:\04516\#Drafting\04516-3\Phase IV Report\Phase IV RIP-08

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological







Appendix A

DEP Transmittal Form (BWSC-108) and Notification Letters

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 3 - 23246

A. SITE LOCATION:

1. Site Name: 50 TUFTS ST & PROP ACROSS THE ST
2. Street Address: 50 TUFTS ST
3. City/Town: SOMERVILLE
4. ZIP Code: 02145-4129

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.

☐ a. Tier IA ☐ b. Tier IB ☑ c. Tier IC ☐ d. Tier II

6. If applicable, provide the Permit Number: W085813

B. THIS FORM IS BEING USED (check all that apply)

☐ 1. Submit a **Phase I Completion Statement**, pursuant to 310 CMR 40.0484.

☐ 2. Submit a **Revised Phase I Completion Statement**, pursuant to 310 CMR 40.0484.

☐ 3. Submit a **Phase II Scope of Work**, pursuant to 310 CMR 40.0834.

☐ 4. Submit an **interim Phase II Report**. This report does not satisfy the response action deadline requirements in 310 CMR 40.0500.

☐ 5. Submit a **final Phase II Report and Completion Statement**, pursuant to 310 CMR 40.0836.

☐ 6. Submit a **Revised Phase II Report and Completion Statement**, pursuant to 310 CMR 40.0836.

☐ 7. Submit a **Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862.

☐ 8. Submit a **Revised Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862.

☑ 9. Submit a **Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874.

☐ 10. Submit a **Modified Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874.

☐ 11. Submit an **As-Built Construction Report**, pursuant to 310 CMR 40.0875.

☐ 12. Submit a **Phase IV Status Report**, pursuant to 310 CMR 40.0877.

☐ 13. Submit a **Phase IV Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879.

Specify the outcome of Phase IV activities: (check one)

☐ a. Phase V Operation, Maintenance or Monitoring of the Comprehensive Remedial Action is necessary to achieve a Response Action Outcome.

☐ b. The requirements of a Class A Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Class C Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) has been or will be submitted to DEP.

☐ d. The requirements of a Class C Response Action Outcome have been met. Further Operation, Maintenance or Monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement and Report (BWSC104) has been or will be submitted to DEP.

B. THIS FORM IS BEING USED TO (cont.):(check all that apply)

☐ 14. Submit a **Revised Phase IV Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879.

☐ 15. Submit a **Phase V Status Report**, pursuant to 310 CMR 40.0892.

☐ 16. Submit a **Remedial Monitoring Report**. (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☐ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

- ☐ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.
- ☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.
- ☐ iii. A Remedial Monitoring Report(s) submitted concurrent with a Status Report.

c. Status of Site: (check one) ☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Class C RAO

d. Number of Remedial Systems and/or Monitoring Programs: ________

A separate BWSC108A, CRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 17. Submit a **Remedy Operation Status**, pursuant to 310 CMR 40.0893.

☐ 18. Submit a **Status Report to maintain a Remedy Operation Status**, pursuant to 310 CMR 40.0893(2).

☐ 19. Submit a **Transfer and/or a Modification of Persons Maintaining a Remedy Operation Status (ROS)** , pursuant to 310 CMR 40.0893(5) (check one, or both, if applicable).

☐ a. Submit a Transfer of Persons Maintaining an ROS (the transferee should be the person listed in Section D, "Person Undertaking Response Actions").

☐ b. Submit a Modification of Persons Maintaining an ROS (the primary representative should be the person listed in Section D, "Person Undertaking Response Actions").

c. Number of Persons Maintaining an ROS not including the primary representative: ________

☐ 20. Submit a **Termination of a Remedy Operation Status**, pursuant to 310 CMR 40.0893(6).(check one)

☐ a. Submit a notice indicating ROS performance standards have not been met. A plan and timetable pursuant to 310 CMR 40.0893(6)(b) for resuming the ROS are attached.

☐ b. Submit a notice of Termination of ROS.

☐ 21. Submit a **Phase V Completion Statement**, pursuant to 310 CMR 40.0894.

Specify the outcome of Phase V activities: (check one)

☐ a. The requirements of a Class A Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC104) will be submitted to DEP.

☐ b. The requirements of a Class C Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Class C Response Action Outcome have been met. Further Operation, Maintenance or Monitoring of the remedial action is necessary to ensure that conditions are maintained and/or that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ 22. Submit a **Revised Phase V Completion Statement**, pursuant to 310 CMR 40.0894.

☐ 23. Submit a **Post-Class C Response Action Outcome Status Report**, pursuant to 310 CMR 40.0898.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number
3 - 23246

C. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that a* ***Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement*** *and/or a* ***Termination of a Remedy Operation Status*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that a* ***Phase II Scope of Work*** *or a* ***Phase IV Remedy Implementation Plan*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that an* ***As-Built Construction Report****, a* ***Remedy Operation Status****, a* ***Phase IV, Phase V or Post-Class C RAO Status Report,*** *a* ***Status Report to Maintain a Remedy Operation Status,*** *a* ***Transfer or Modification of Persons Maintaining a Remedy Operation Status*** *and/or a* ***Remedial Monitoring Report*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9719
2. First Name: ILEEN S
3. Last Name: GLADSTONE
4. Telephone: (781) 721-4012
5. Ext.:
6. FAX:
7. Signature: ILEEN S GLADSTONE
8. Date: 08/10/2009 (mm/dd/yyyy)
9. LSP Stamp:

Commonwealth of Massachusetts
Electronic Seal
Licensed Site Professional

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

BWSC108

Release Tracking Number 3 - 23246

D. PERSON UNDERTAKING RESPONSE ACTIONS:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: UNIFIRST CORPORATION

3. Contact First Name: JOHN R 4. Last Name: BADEY

5. Street: 68 JONSPIN RD 6. Title: VICE PRESIDENT

7. City/Town: WILMINGTON 8. State: MA 9. ZIP Code: 01887-1090

10. Telephone: (800) 347-7888 11. Ext.: 12. FAX: (978) 988-1305

E. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTIONS:

☐ Check here to change relationship

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions Specify Relationship:

F. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of any Phase Reports to DEP.

☐ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase III Remedial Action Plan.

☑ 4. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase IV Remedy Implementation Plan.

☑ 5. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of any field work involving the implementation of a Phase IV Remedial Action.

☐ 6. If submitting a Transfer of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for the person making this submittal (transferee) is attached.

☐ 7. If submitting a Modification of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for each new person making this submittal is attached.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Name. Send corrections to: BWSC.eDEP@state.ma.us.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number 3 - 23246

G. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTIONS:

1. I, **JOHN R BADEY** , attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

>*if Section B indicates that this is a* **Modification of a Remedy Operation Status (ROS)**, I attest under the pains and penalties of perjury that I am fully authorized to act on behalf of all persons performing response actions under the ROS as stated in 310 CMR 40.0893(5)(d) to receive oral and written correspondence from MassDEP with respect to performance of response actions under the ROS, and to receive a statement of fee amount as per 4.03(3).

I understand that any material received by the Primary Representative from MassDEP shall be deemed received by all the persons perform ing response actions under the ROS, and I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate or incomplete information.

2. By: **JOHN R BADEY** 3. Title: **VICE PRESIDENT**
Signature

4. For: **UNIFIRST CORPORATION** 5. Date: **08/10/2009**
(Name of person or entity recorded in Section D) (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section D.

7. Street:
8. City/Town: 9. State: 10. ZIP Code:
11. Telephone: 12. Ext.: 13. FAX:

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

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RTN: 3-23246
Location: 50 TUFTS ST & PROP ACROSS THE ST
Address: 50 TUFTS ST, SOMERVILLE, 021454129

Person Making Submittal
UNIFIRST CORPORATION
JOHN R BADEY
68 JONSPIN RD
WILMINGTON, MA 018871090

LSP
LSP #: 9719
LSP Name: ILEEN S GLADSTONE

Person Making Certification
UNIFIRST CORPORATION
John R Badey
UNIFIRST CORPORATION
John R Badey

Additional Forms Submitted

Ancillary Document Uploaded/Mailed

BWSC-108 Ques.B09 - Phase IV Remedy Implementation Plan - Uploaded (Tufts Phase IV RIP Transmittal Cover.pdf)

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GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

August 10, 2009
Project 04516-3

Mayor Joseph A. Curtatone
Somerville City Hall
93 Highland Avenue
Somerville, MA 02143-1740

Dear Mayor Curtatone

Re: Phase IV Remedy Implementation Plan Notification
50 Tufts Street
Somerville, Massachusetts
RTN 3-23246

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office of the availability of a Phase IV Remedy Implementation Plan (RIP) and the implementation of field work associated with Phase IV remedial actions for the disposal site located at 50 Tufts Street and neighboring properties in Somerville, Massachusetts (the Site). The Massachusetts Department of Environmental Protection (DEP) assigned Release Tracking Number (RTN) 3-23246 to the Site.

The Phase IV RIP was filed via eDEP and is available on the DEP website and/or may be reviewed at the DEP Northeast Regional Office in Wilmington, Massachusetts. The Phase IV RIP will also be filed with the City of Somerville Public Library and Somerville City Clerk.

In accordance with the Massachusetts Contingency Plan (MCP, 310 CMR 40.0871), the purpose of this Phase IV RIP is to document the requirements for the design, construction, and implementation of the Comprehensive Response Actions selected for the Site.

The Phase IV RIP proposes the following remedial actions:

- Install, operate, and/or monitor Exposure Pathway Elimination Measures (EPEMs) (e.g., passive ventilation system or sub slab depressurization systems) and record Activity and Use Limitations for properties where chlorinated volatile organic compounds (VOCs) were detected in the occupied space of a residence or school (i.e., a Critical Exposure Pathway [CEP]) or concentrations of chlorinated VOCs measured in occupied commercial buildings exceed concentrations constituting a condition of No Significant Risk.
- Continue, if necessary, the operation of the soil vapor extraction system at the 50 Tufts Street property to remove contaminants from the vadose zone.
- Conduct a Site-wide monitored natural attenuation program to evaluate the effect of attenuation processes on chlorinated VOC concentrations in the downgradient groundwater plume and estimate the time required to achieve remedial objectives.

This notification is made in fulfillment of the public notice requirements of the MCP (310 CMR 40.1403). If you have any questions, please contact me at 781-721-4012 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

LJW/ISG:csh

c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

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GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

August 10, 2009
Project 04516-3

Ms. Paulette Renault Caragianes
Director, Health Department
City Hall Annex
50 Evergreen Avenue
Somerville, MA 02145-2819

Dear Ms. Caragianes:

Re: Phase IV Remedy Implementation Plan Notification
50 Tufts Street
Somerville, Massachusetts
RTN 3-23246

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office of the availability of a Phase IV Remedy Implementation Plan (RIP) and the implementation of field work associated with Phase IV remedial actions for the disposal site located at 50 Tufts Street and neighboring properties in Somerville, Massachusetts (the Site). The Massachusetts Department of Environmental Protection (DEP) assigned Release Tracking Number (RTN) 3-23246 to the Site.

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Sincerely,

GEI CONSULTANTS, INC.

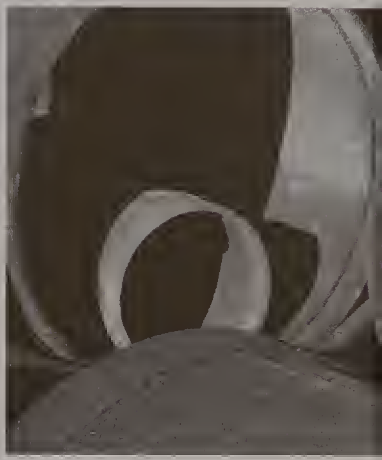
Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

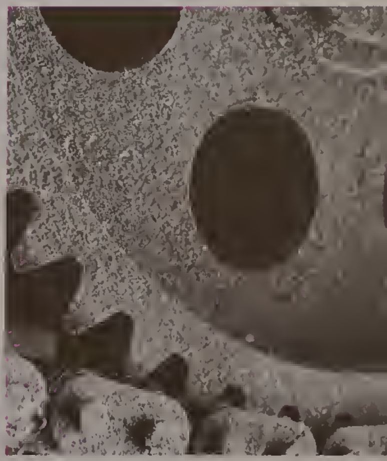
LJW/ISG:csh

c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering





Appendix B

O&M Manuals (Enclosed on CD)

50 Tufts Street Property

60 Tufts Street Property

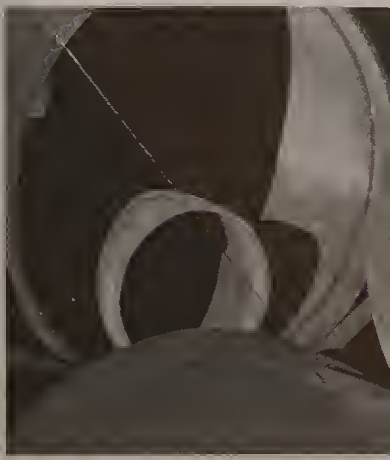
Michael E. Capuano Early Childhood Center

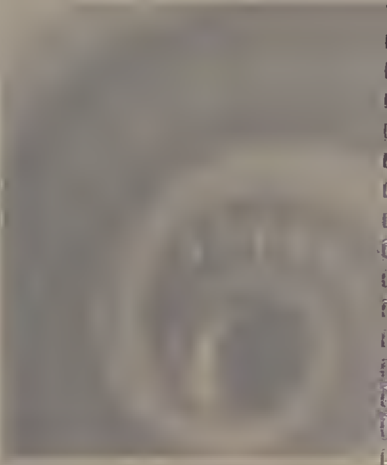
EPEM Option 1

EPEM Options 2 and 3

GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering





Appendix C

Health and Safety Plan

GEI Consultants

Geotechnical
Environmental
Water Resources
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Health and Safety Plan

50 Tufts Street, Somerville Massachusetts

Submitted to:
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887

Submitted by:
GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801
781-721-4000

August 2009

Project 04516-3

William F. Simons, P.G., LSP
Project Manager

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HAB/WFS:csh
N:\04516\9.0 Health & Saftey Plan and Work Plan\HASP\Tufts Street HASP 080709.docx

Abbreviations and Acronyms

$\mu g/m^3$	micrograms per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
C	ceiling limit, not to be exceeded
CAS	Chemical Abstracts Service Registry Numbers
CHSO	Corporate Health and Safety Officer
CNS	Central Nervous System
DEP	Massachusetts Department of Environmental Protection
EPA	United States Environmental Protection Agency
EPEMs	Exposure pathway elimination measures
eV	electron volt
EZ	Exclusion Zone
FP	Flash point
GEI	GEI Consultants, Inc.
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
HWCP	Hazardous Waste Contingency Plan
IP	Ionization Potential
IRA	Immediate Response Action
LEL	Lower explosive limit
LQG	Large Quantity Generator
MBCR	Massachusetts Bay Commuter Rail Company
MBTA	Massachusetts Bay Transit Authority
mmHg	millimeters Mercury
mppcf	million particles per cubic foot
MSDS	Material Safety Data Sheet
NA	Not available
NFPA	National Fire Protection Association
OSHA	Occupational Health and Safety Administration
PCE	Tetrachloroethylene
PEL	Permissible Exposure Limit
PID	Photo-ionization detector
PPE	Personal Protective Equipment
ppm	parts per million
ROW	Right-of-Way
RTN	Release Tracking Number
SCBA	Self Contained Breathing Apparatus
Skin	significant route of exposure

SSDS	Sub-slab Depressurization System
SVE	Soil Vapor Extraction System
SZ	Support Zone
TCA	1,1,1-Trichlorethane
TCE	Trichloroethylene
TLV	Threshold Limit Value
TWA	Time-weighted average (8 hours)
UEL	Upper explosive limit
VOC	Volatile organic compound
VP	vapor pressure

1. Background Information

1.1 General

Engineer	GEI Consultants, Inc. 400 Unicorn Park Drive Woburn, MA 01801-3341
Project Name	50 Tufts Street, Somerville, Massachusetts

This Health and Safety Plan (HASP) establishes policies and procedures to protect GEI personnel from the potential hazards posed by the activities at the 50 Tufts Street site in Somerville, Massachusetts (the Site). Reading of the HASP is required of all on-site GEI personnel. This HASP was prepared only for the use of GEI personnel; however, GEI may provide a copy of this HASP for informational purposes to GEI's subcontractors who have the potential for exposure to Site contaminants while working on the Site. The plan identifies measures to minimize accidents and injuries, which may result from project activities or during adverse weather conditions.

1.2 Project Description

The work planned at the Site includes:

1. Groundwater elevation gauging and sampling.
2. Building and Site observations.
3. Soil vapor monitoring point installation and soil sampling.
4. Soil vapor and air sampling.
5. Subsurface utility investigation, and water and sediment sampling.
6. Exposure pathway elimination measures (EPEMs) installation observation, monitoring, and maintenance.

1.3 Site Description

The Site is located along Tufts Street in Somerville, Massachusetts (Fig. 1), and includes the 50 Tufts Street property (the Property) as well as portions of a public street and several residential and commercial properties located east of the Property (Fig. 2). The Property was frequently used to store and distribute industrial and dry cleaning chemicals. The compounds identified at the Site include chlorinated volatile organic compounds (VOCs) in soil, groundwater, and indoor air. The Site was previously listed by the Massachusetts Department of Environmental Protection (DEP) under release tracking numbers

(RTNs) 3-23246, 3-24358, and 3-24376. The Site is now listed under one consolidated RTN (3-23246).

The Property is zoned for business. It is approximately 51,111 square feet and developed with an approximately 20,594 square foot (sf), one-story masonry block building (Fig. 2). The majority of the Property building is warehouse space and a small portion is office space.

The eastern side of the building abuts the sidewalk and then Tufts Street, and on the western side of the building is a narrow strip of vegetation and then railroad tracks. Immediately north and south of the building is paved parking. Further south of the building is a grassed hill that slopes towards Washington Street. Access to the Property is restricted by a 6-foot high, chain-link fence.

1.4 Hazard/Risk Analysis

The work planned at the Site will be performed in the building on the Property, on private residential and commercial property, in City streets, and on the railroad right-of-way (ROW). Physical hazards associated with the work include, tripping hazards, drill rig operation, and vehicular traffic. Physical hazards associated with the work on the railroad ROW include being struck by a train or other equipment and tripping hazards. Physical hazards associated with work in City streets and utilities include vehicular traffic and tripping into a manhole or catch basin.

Smoking is prohibited at or in the vicinity of hazardous operations or materials.

The specific physical hazards associated with the work and associated control measures are listed in the following Activity Hazard Analysis and Site Hazards sections.

1.5 Activity Hazard Analysis

- **Activity: Groundwater Elevation Gauging and Sampling**

Task	Potential Hazard	Control Measure
1. Monitoring well gauging	Contaminant contact/vapor	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
2. Groundwater sampling	Contaminant contact/vapors	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.

- **Activity: Building and Site Observations**

Task	Potential Hazard	Control Measure
1. Building and Site observation	Be alert to traffic in the area	Be alert to traffic in the area.

- **Activity: Soil Vapor Monitoring Point Installation and Soil Sampling**

Task	Potential Hazard	Control Measure
1. Drilling	Operation of electric drilling equipment within a building	Hard hat, leather gloves, steel-toed boots, and safety glasses.
	Noise	Hearing protection.
	Contaminant contact/vapors	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. Photo-ionization detector (PID) readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
2. Soil sampling	Contaminant contact	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.

- **Activity: Soil Vapor and Air Sampling**

Task	Potential Hazard	Control Measure
1. Soil vapor and air sampling	Contaminant vapors	No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.

- **Activity: Subsurface Utility Investigation and Water and Sediment Sampling**

Task	Potential Hazard	Control Measure
1. Observation of utility *	Tripping into open utility, including a deep pump station pit (confined space).	Work in teams, obtain assistance of owner of utility (City of Somerville, Massachusetts Bay Transit Authority (MBTA), etc.) when possible. Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
2. Sanitary sewer and storm drain sampling *	Biological (fecal) waste or contaminant contact	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
3. Utility work on railroad ROW *	Being struck by a train or other equipment	Attend appropriate ROW safety training. Work with a Flagman and other appropriate safety measures practiced by entity operating the ROW. Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.

** No part of the GEI Personnel's body may break the plane of the opening to the utilities, unless a confined space evaluation is conducted and/or permit is obtained from GEI's Corporate Health and Safety Officer (Robin DeHate).*

- **Activity: EPEM Installation Observation, Monitoring, and Maintenance**

Task	Potential Hazard	Control Measure
1. Construction demolition	Flying debris	Hard hat, steel-toed boots, and safety glasses.
2. Construction observation	Flying debris and heavy equipment	Hard hat, steel-toed boots. Be alert!
3. Drilling	Operation of electric drilling equipment within a building	Hard hat, steel-toed boots, and safety glasses.
	Noise	Hearing protection
	Contaminant contact/vapors	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. Photo-ionization detector (PID) readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
4. Soil sampling	Contaminant contact	Disposable vinyl, nitrile, or latex gloves; safety glasses. Dispose of gloves after use. Wash hands. No eating or drinking in the work area. PID readings above action levels (HASP Section 8) require stopping work and contacting the Project Manager.
5. Activated carbon tank refilling and observations	Confined space, where carbon can reduce oxygen	Do not enter without a confined space permit, work in pairs.

1.6 Site Hazard Analysis

General Site hazards and control measures are as follows:

Potential Hazards	Control Measures
1. Inclement Weather	Weather reports, proper clothing, and work stoppage.
2. Heat/Cold Stress	Proper clothing, acclimatization, regular work breaks, fluid intake, look for signs of heat/cold stress.
3. Chemical Exposure	Safety glasses, disposable vinyl, nitrile, or latex gloves.
4. Electrical Hazards	GEI portable electrical equipment is equipped with a Ground Fault Circuit Interrupter (GFCI)
5. Slip/Trip/Fall	Keep trafficked areas free of slip/trip/fall hazards.
6. Heavy Lifting – Sprains & Strains	Use proper lifting techniques. Ask fellow worker for help.
7. Falling or handling debris – crushing, eye injury, head injury	Maintain awareness of operations and keep a safe distance away from overhead equipment and wear eye protection and hard hat.
8. Vehicular traffic	Maintain awareness of traffic and wear visible clothing. When working in the street, hire a police detail.
General on-site provisions shall include: disposable vinyl, nitrile, or latex gloves, drinking water, first aid kit, hearing protection, and hand and eye wash solution.	

1.7 Evaluation of Potential Chemical Hazards

Soil, groundwater, soil vapor, and indoor air in portions of the Site may contain chlorinated VOCs. Petroleum-related compounds have also been detected in soil on the Property. The primary contaminant in soil at the Site is tetrachloroethylene (also called perchloroethylene [PCE]). This contaminant has the potential to be present in soil cuttings generated during drilling activities and soil vapor sample collection.

The primary VOCs measured in groundwater are PCE, trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA). These contaminants have the potential to be present in the groundwater encountered during drilling activities and groundwater and utility water sampling. In addition, the operation of the equipment inside the building may generate carbon monoxide from incomplete fuel combustion. Drilling through concrete can release respirable dusts into the work zone. When sampling combined or sanitary sewers, it is also possible to come into contact with human waste, which presents the possibility of biological contamination.

The potential primary hazards of these contaminants are identified as follows. Note that the matrices specified for each contaminant are not necessarily exclusive but are based on the known information for the Site. This HASP is intended to be sufficiently stringent to provide GEI personnel protection from the potential contaminants listed, regardless of matrix.

CONTAMINANT:	**VOCs**			
Possible Sources:	Industrial and dry cleaning chemicals			
Form:	Vapor ☒	Liquid ☒	Solids (absorbed) ☒	Other________
Characteristic:	Corrosive ☒	Ignitable ☐	Radioactive ☐	Volatile ☒
	Toxic ☒	Reactive ☐	Other________	Unknown ☐
Matrix:	Soils ☒	Debris ☐	Groundwater ☒	Other________

CONTAMINANT:	**Portland Cement**			
Possible Sources:	Drilling through concrete			
Form:	Vapor ☒	Liquid ☒	Solids ☒	Other________
Characteristic:	Corrosive ☒	Ignitable ☐	Radioactive ☐	Volatile ☒
	Toxic ☒	Reactive ☐	Other________	Unknown ☐
Matrix:	Soils ☒	Debris ☐	Groundwater ☒	Other dusts

CONTAMINANT:	**Biological**			
Possible Sources:	Utility Water sampling			
Form:	Vapor ☐	Liquid ☒	Solids ☒	Other________
Characteristic:	Corrosive ☐	Ignitable ☐	Radioactive ☐	Volatile ☐
	Toxic ☐	Reactive ☐	Other pathogen	Unknown ☐
Matrix:	Soils ☐	Debris ☐	Groundwater ☐	Other water/solids

Material Safety Data Sheets (MSDS) (as available) and/or Occupational Health Guidelines for contaminants potentially found at the Site (and/or for products that are potentially the source of contamination), and for decontamination chemicals that may be used on site, are included in Appendix A.

Specific chemical hazards information from the MSDS and Occupational Health Guidelines are summarized below.

Contaminant	CAS No.	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Properties
PCE	127-18-4	25 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation, nausea, vomiting, chest pain, difficulty breathing, headache, drowsiness, dizziness, disorientation, loss of coordination, blurred vision, loss of appetite, stomach pain, pain in extremities	Eyes, skin, respiratory system, liver, CNS	A colorless, sweet smelling volatile liquid. FP: NA IP: 9.32 eV LEL: NA UEL: NA VP: 14 mmHg
TCE	79-01-6	200 ppm	100 ppm TWA 200 ppm C 300 ppm (5 minutes in any 3 hours)	Inhalation, Ingestion, Skin Contact	Irritation to eyes, skin, dizziness, fatigue, blurred vision, tremors, nausea, vomiting, drowsiness, headache	Kidneys, CNS, liver, heart, upper respiratory	Colorless liquid with chloroform odor FP: NA IP: 9.45 eV LEL: 8% UEL: 10.5% VP: 58 mmHg
TCA	71-55-6	NA	350 TWA	Inhalation Ingestion Skin Contact	Irritation of eyes, nausea, vomiting, dizziness, drowsiness, blurred vision, headache	Respiratory system, CNS, liver, mucous membranes	Colorless liquid FP: NA? IP: 11 eV LEL: 7.5% UEL: 12.5% VP: 100 mmHg
Portland Cement	65997-15-1	10 µg/m^3 (total) TWA 5 µg/m^3 (resp)	TWA 50 mppcf	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis	Eyes, skin, respiratory system	Gray, odorless powder FP: NA IP: NA LEL: NA UEL: NA VP: 0 mmHg

Abbreviations

µg/m^3 = micrograms per cubic meter
ACGIH = American Conference of Governmental Industrial Hygienists, Inc.
A.L: Action Level
C = ceiling limit, not to be exceeded
CAS = Chemical Abstracts Service Registry Numbers
CNS = Central Nervous System
eV = electron volt
FP = Flash point
IP = Ionization Potential
LEL = Lower explosive limit
mmHg = millimeters Mercury
mppcf = million particles per cubic foot
NA = Not available
OSHA = U. S. Occupational Safety & Health Administration
PEL = Permissible Exposure Limit
ppm = parts per million
Skin = significant route of exposure
TLV = Threshold Limit Value
TWA = Time-weighted average (8 hours)
UEL = Upper explosive limit
VP = vapor pressure approximately 68° F in mmHg (millimeters mercury)

1.8 Levels of Protection Required

Personal Protective Equipment (PPE) required for each level of protection is as follows:

Safety Equipment	Level A*	Level B*	Level C*	Level D
Work clothes				•
Hard hats with splash shields or safety glasses			•	•
Steel-toe boots				•
Steel-toe boots with overboots			•	
Chemical-resistant gloves as appropriate for work being performed and materials handled			•	•
Half- or full-face respirators with organic vapor cartridges as approved by the Corporate Health and Safety Officer (CHSO)			•	
TyvekTM splash-resistant suit			•	
Chemical-resistant clothing		•		
Pressure-demand, full-face Self Contained Breathing Apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA	•	•		
Inner and outer chemical-resistant gloves	•	•		
Chemical-resistant safety boots or shoes	•	•		
Two-way radio	•	•		
Hard hat	•	•		
Fully encapsulating chemical-resistant suit	•			

* Only permitted in consultation with Project Manager and CHSO.

PPE requirements for field activities are as follows:

Activity	Level of Protection	Backup Protection
Site Observations	D	C
Sample collection	D	C

Use of Level A, B, or C PPE is not anticipated. If conditions indicating the need for Level C PPE are encountered, personnel will leave the exclusion zone and contact the Project Manager for further guidance.

2. Statement of Safety and Health Policy

GEI is committed to providing a safe and healthy work environment for its employees. To maintain a safe work environment, GEI has established an organizational structure and a Corporate Health and Safety Program to promote the following objectives:

- Reduce the risk of injury, illness, and loss of life to GEI employees.
- Maintain compliance with federal, state, and other applicable safety regulations; and minimize GEI employees' work exposure to potential physical, chemical, biological, and radiological hazards.

3. Key Project Personnel/Responsibilities and Lines of Authority

GEI Personnel:

Robin DeHate	GEI Corporate Health and Safety Officer (corporate stewardship, highest health and safety authority.)
Ileen Gladstone	GEI Project LSP (Licensed Site Professional)
Bill Simons	GEI Project Manager (day-to-day management, lowest health and safety authority.)

Lines of Authority will be as follows:

On-site – GEI will have responsibility for safety of its employees during the work performed at the 50 Tufts Street Site. GEI's field representative will have a cell phone available to contact the appropriate local authorities, in the event of an emergency. GEI's field representative will be available for communication with the GEI Project Manager.

4. Subcontractors

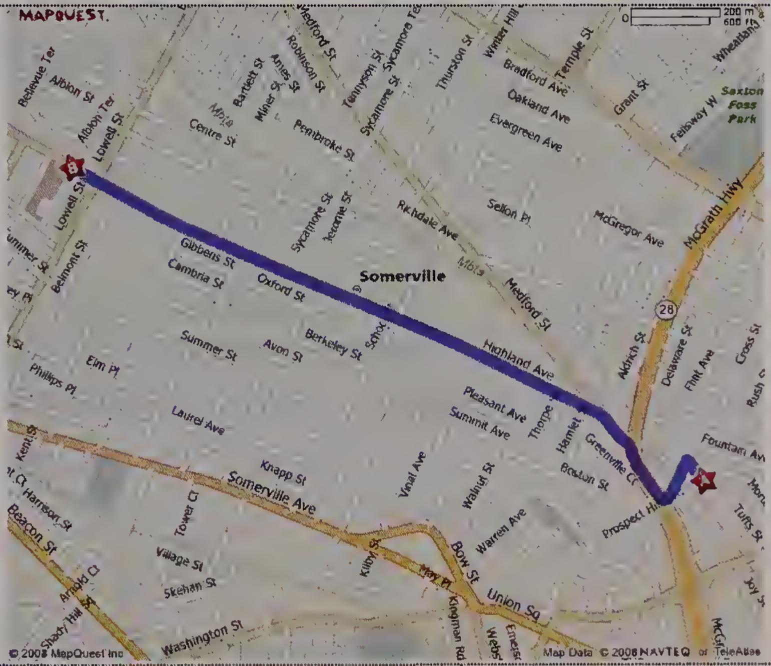
GEI has subcontracted the following firms to assist in performing work on this project:

Norfolk Services, Inc.	c/o Michael Delellis P.O. Box 38 Bridgewater, MA 02324 508-807-1076 (office) 508-245-3722 (cell)
BSC Group	c/o Dave Crispin 15 Elkins Street Boston, MA 02127 617-896-4300 (office) 617-896-4301 (fax)
TMC Services, Inc.	c/o Norm Geary 1 William Way Bellingham, MA 02019 508-966-3737 (office) 508-966-4861 (fax)
Trident Environmental Group, LLC	c/o William Zoulias 62 Lacombe Street, Unit #14 Marlborough, MA 01752 508-229-3545 (office) 508-229-8130 (fax)

GEI requires its subcontractors to work in a responsible and safe manner. Subcontractors for this project will be required to develop their own HASP for projection of their employees but at a minimum must adhere to applicable requirements set forth in this HASP.

5. Emergency Contact List

EMERGENCY INFORMATION

Important Phone Numbers		Directions to Hospital
Local Police 221 Washington St	911 617-625-1600	Somerville Hospital 230 Highland Avenue (617) 591-4500 1) Start out going NW on Tufts Street toward Dell St (<0.1miles) 2) Turn left on Cross Street (<0.1 miles) 3) Turn right onto McGrath Highway (<0.1 miles) 4) McGrath Highway becomes Medford Street (<0.1 miles) 5) Turn slight left onto Highland Avenue (9 miles 6) End at 230 Highland Avenue
Fire Department 266 Broadway	911 617-623-1700	
Ambulance	911	
State Police or County Sheriff	617-455-5600	
Somerville Hospital	617-591-4500	
Project Manager Bill Simons., LSP	781-721-4029 (office) 781-507-6865 (cell)	
Licensed Site Professional Ileen Gladstone, P.E., LSP, LEED AP	781-721-4012 (office) 781-424-9924 (cell) 617-742-2588 (home)	
Corporate Health and Safety Officer Robin DeHate	813-654-8055 office 813-323-6220 cell	
Client Contact (UniFirst) John R. Badey	978-658-8888 x645	
Nearest Telephone Location:	On-site cellular	

6. Training Program

6.1 General Health and Safety Training

In accordance with GEI Occupational Safety and Health Administration (OSHA) regulation (29 CFR 1910.120), hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. GEI personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the GEI CHSO or her representative prior to the start of field activities.

6.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of GEI hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures. Proof of current 8-hour refresher training shall be submitted to the GEI CHSO or her representative prior to the start of field activities.

6.3 Supervisor Training

GEI personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training. In addition, GEI supervisors shall have one year of field experience and training specific to work activities (i.e., sampling, construction observation, etc.)

6.4 Site-Specific Training

Prior to commencement of field activities, the GEI CHSO or her representative will ensure all GEI field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the Site operations. It will include Site and facility layout, hazards and emergency services at the Site and will highlight all provisions contained within this HASP. This training will also allow GEI field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. GEI personnel that have not received Site-specific training will not be allowed on-site.

6.5 On-Site Safety Briefings

Other GEI personnel will be given health and safety briefings periodically by GEI's field representative to assist GEI personnel in safely conducting work activities. The briefings

will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the GEI workers on monitoring results.

6.6 Railroad ROW Worker Training

GEI personnel that will be working within the Massachusetts Bay Transportation Authority railroad ROW will attend the annual safety training required by the operating company in the area. The railroad tracks near the Property are operated by the Massachusetts Bay Commuter Rail Company (MBCR), and this is the only known training needed for workers within the ROW.

6.7 Large Quantity Generator Hazardous Waste Training

The carbon treatment system at the Property generates hazardous waste that is correctly disposed of under an U.S. Environmental Protection Agency (EPA) Large Quantity Generator (LQG) permit. As a result, GEI personnel that will be handling the sub-slab depressurization system/soil vapor extraction system (SSDS/SVE) at the Property must take an 8 hour Hazardous Waste Training course, and be aware of the Hazardous Waste Contingency Plan (HWCP) developed for the system.

7. Medical Surveillance Program

GEI maintains a continuous, corporate, medical surveillance program that includes a plan designed specifically for field personnel engaged in work at sites where hazardous or toxic materials may be present. Robin DeHate is GEI's CHSO and is responsible for the administration and coordination of medical evaluations conducted for GEI's employees at all branch office locations. Comprehensive examinations are given to all GEI field personnel participating in hazardous waste operations on an annual or biennial basis (as determined to be appropriate by the CHSO). The medical results of the examinations aid in determining the overall fitness of employees participating in field activities.

Robin DeHate
GEI Consultants, Inc.
14409 North Nebraska Avenue, Suite A
Tampa, FL 33613
(813) 774-6564 (office)
(813) 323-6220 (cell)

Under the CHSO's supervision, all GEI field personnel undergo a complete initial physical examination, including a detailed medical and occupational history, before they participate in hazardous waste site investigations. Extensive annual/biennial reexaminations are also performed. Upon completion of these tests, personnel are certified by an occupational health physician as to whether they are fit for field work in general, and fit to use all levels of respiratory protection, in particular.

If a GEI employee or other project worker shows symptoms of exposure to a hazardous substance and wishes to be rechecked, he/she will be directed to the nearest area hospital or medical facility.

GEI subcontractor personnel that will enter any active waste handling or other active non-"clean" area must participate in a medical surveillance program that complies with OSHA regulations for hazardous waste operations (i.e., 29 CFR 1910.120 and 29 CFR 1926.65).

8. Monitoring

Monitoring shall be performed to identify and quantify airborne levels of hazardous substances and safety and health hazards applicable to GEI personnel in order to determine the appropriate level of GEI worker protection needed on site.

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID (VOCs)	Work Zone	0.5 ppm	Call project manager to reassess Site conditions.
	Perimeter	0.5 ppm	

9. Site Control Measures

9.1 Site Zones

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A two-zone approach will be utilized. It shall include an Exclusion Zone (EZ) and a Support Zone (SZ). Specific zones shall be established on the work Site by GEI prior to the beginning of each of four tasks requiring such delineation.

This project is being conducted under the requirements of 29 CFR 1910.120, and any GEI personnel working in an area where the potential for exposure to site contaminants exists, will only be allowed access after proper training and medical documentation.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for medical emergency. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone.

Exclusion Zone - Activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The size of the EZ shall be determined, constructed, and maintained by GEI, if under our control, allowing adequate space for the activity to be completed, field members, and emergency equipment.

9.2 Accident Reporting

GEI will report incidents involving GEI personnel or GEI subcontractor personnel, such as: lost time injuries, injuries requiring medical attention, near miss incidents, fires, fatalities, accidents involving the public, and property damage. The report shall be made to the GEI Project Manager verbally within 2 hours of the incident. The Project Manager will inform the CHSO and the Director of Human Resources of the incident. Occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be recorded on OSHA Form 300 by GEI's or the subcontractor’s personnel within 48 hours of occurrence as is required by statute.

9.3 Medical Support

In case of minor injuries, on-site care shall be administered with the Site first aid kit. For serious injuries, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger.

Section 5 of this HASP contains detailed emergency information, including directions to the nearest hospital, and a list of emergency services and their telephone numbers. GEI field personnel will carry a cellular telephone.

10. Decontamination Procedures

10.1 Personnel Decontamination Station

It is not anticipated that GEI personnel will be in contact with contaminates other than handling of the drilling equipment or sampled media. Therefore, the extent of personnel decontamination will be frequent changing of the protective disposable vinyl, nitrile, or latex gloves and properly disposing of the contaminated gloves in a designated trash bag. Water and detergent should be available to personnel at the Site to wash themselves wherever they have potentially been exposed to contaminants (e.g., hands, face, etc.).

Contaminated PPE (gloves, etc.) will be placed in plastic bags (or other appropriate container) and disposed of appropriately.

11. Personal Protective Equipment

At a minimum, PPE will include protective clothes. Site activities and their associated PPE are outlined in Section 1 of this HASP.

12. Supplemental Contingency Plan Procedures

Hazard Communication Plan

GEI personnel have received hazard communication training as part of their 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) OSHA training. Hazardous materials used on the Site will be properly labeled, stored, and handled. MSDS will be available to potentially exposed GEI employees.

Fire

In the event of a fire, GEI personnel will evacuate the area. GEI's field representative or the subcontractor will contact the local fire department with jurisdiction and report the fire. Notification of evacuation will be made to the GEI Project Manager. The field representative will account for GEI personnel and report their status to the GEI Project Manager.

Severe Weather

The contingency plan for severe weather includes reviewing the expected weather to determine if severe weather is in the forecast. Severe weather includes high winds over 30 mph, heavy rains or snow squalls, thunderstorms, hurricanes, and lightning storms. If severe weather is approaching, the decision to evacuate GEI personnel from the Site will be the responsibility of GEI's field representative. Notification of evacuation will be made to the GEI Project Manager. The field representative will account for GEI personnel and report their status to the GEI Project Manager.

Alcohol and Drug Abuse Prevention

Alcohol and drugs will not be allowed on the work site. Project personnel under the influence of alcohol or drugs will not be allowed to enter the Site.

13. Health and Safety Plan Sign-Off

GEI personnel conducting Site activities must read the Health and Safety Plan, be familiar with its requirements, and agree to its implementation.

Once the Health and Safety Plan has been read, complete this sign-off sheet, and return it to the Project Manager.

Site Name:

50 Tufts Street, Somerville, Massachusetts

Investigation:

Subsurface investigations

GEI Project No: 04516-3

I have received and read the Health and Safety Plan, been briefed on it, and agree to its implementation.

Name:	Signature:	Date:
Name:	Signature:	Date:
Name:	Signature:	Date:
Name:	Signature:	Date:
Name:	Signature:	Date:
Name:	Signature:	Date:
Name:	Signature:	Date:
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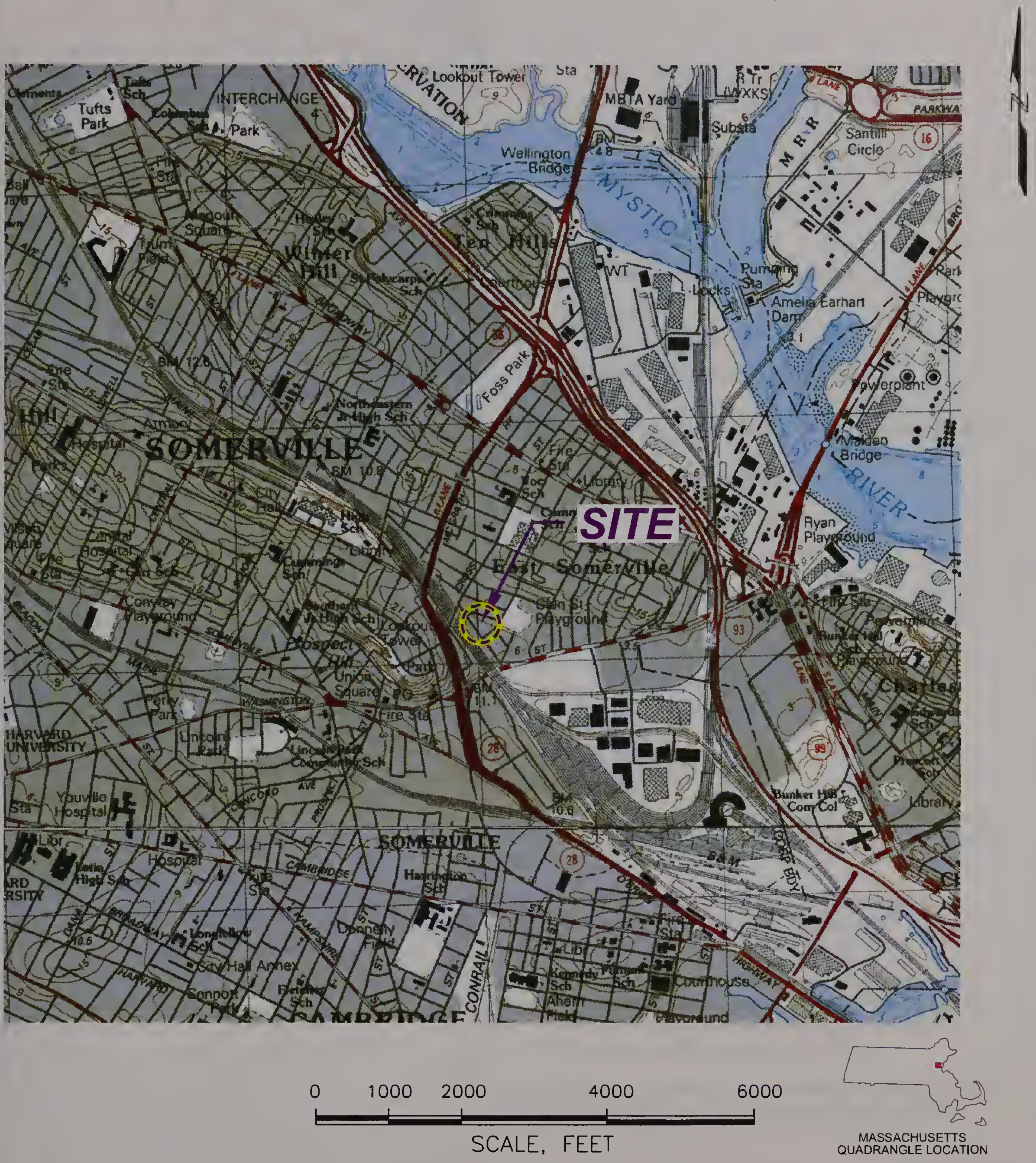


This Image provided by MassGIS is taken from
U.S.G.S. Topographic 7.5 X 15 Minute Series
Boston North, MA Quadrangle, 1985.
Datum is National Geodetic Vertical Datum (NGVD).
Contour Interval is 3 Meters.

Health and Safety Plan
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

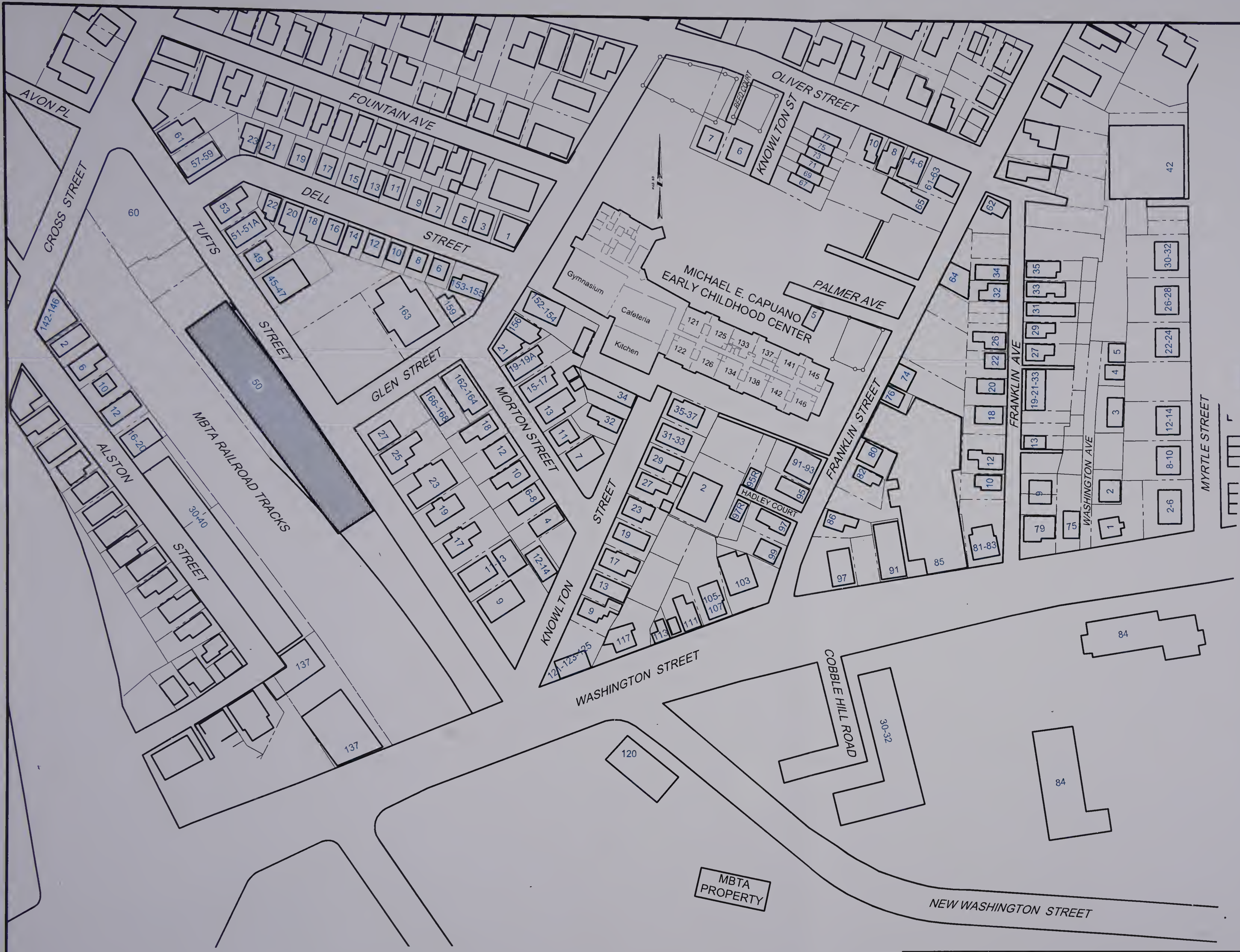
Project 04516-3

SITE LOCATION MAP

August 2009

Fig. 1

N:\04516\#Drafting\04516-3\Phase IV Report\045163- Health&Safety-01.dwg



0 150 300

APPROXIMATE SCALE, FEET

LEGEND:

138 ROOM NUMBER AT CAPUANO SCHOOL

84 STREET ADDRESS

BOUNDARY OF COMMUNITY GARDENS

MBTA = MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

▨ = 50 TUFTS STREET PROPERTY

GENERAL NOTES:

1. HORIZONTAL CONTROL FOR THIS PLAN WAS ESTABLISHED BY GPS AND IS BASED ON THE NORTH AMERICAN DATUM OF 1983.
2. STREET AND PROPERTY LINES BASED ON SOMERVILLE ASSESSORS' MAPS AND ARE BEST FIT RELATIVE TO THE LOCATION OF THE 50 TUFTS STREET BUILDING.
3. CAPUANO CENTER BUILDING IS BASED ON DRAWING A0.2 FROM THE ARCHITECTURAL BID SET OF "THE EDGERTY EARLY CHILDHOOD DEVELOPMENT CENTER" BY HMFH ARCHITECTS, INC., DATED AUGUST 10, 2001.
4. CAPUANO CENTER COMMUNITY GARDEN LOCATIONS WERE ESTABLISHED BY AN ON THE GROUND SURVEY BY BSC GROUP, INC. IN JULY 2007.

Health and Safety Plan
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

SITE AREA

Project 04516-3 | August 2009 | Fig. 2

N:\04516\#Drafting\04516-3\Phase IV Report\045163- Health&Safety-02

Appendix A

Material Safety Data Sheets (MSDS) (as available) and/or Occupational Health Guidelines

September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Tetrachloroethylene

CAS 127-18-4

$Cl_2C=CCl_2$

RTECS KX3850000

Synonyms & Trade Names
Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

DOT ID & Guide
1897 160

Exposure Limits

NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A

OSHA PEL†: †: TWA 100 ppm
C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

IDLH Ca [150 ppm] See: 127184

Conversion 1 ppm = 6.78 mg/m^3

Physical Description
Colorless liquid with a mild, chloroform-like odor.

MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities
Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Measurement Methods
NIOSH 1003; OSHA 1001
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

See also: INTRODUCTION See ICSC CARD: 0076 See MEDICAL TESTS: 0179

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NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Trichloroethylene

CAS 79-01-6

$ClCH=CCl_2$

RTECS KX4550000

Synonyms & Trade Names
Ethylene trichloride, TCE, Trichloroethene, Trilene

DOT ID & Guide
1710 160

Exposure Limits

NIOSH REL: Ca See Appendix A See Appendix C

OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

IDLH Ca [1000 ppm] See: 79016

Conversion 1 ppm = 5.37 mg/m^3

Physical Description
Colorless liquid (unless dyed blue) with a chloroform-like odor.

MW: 131.4	BP: 189°F	FRZ: -99°F	Sol(77°F): 0.1%
VP: 58 mmHg	IP: 9.45 eV		Sp.Gr: 1.46
Fl.P: ?	UEL(77°F): 10.5%	LEL(77°F): 8%	

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities
Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Measurement Methods
NIOSH 1022, 3800; OSHA 1001
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system

Cancer Site [in animals: liver & kidney cancer]

See also: INTRODUCTION See ICSC CARD: 0081 See MEDICAL TESTS: 0236

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NIOSH Pocket Guide to Chemical Hazards

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Methyl chloroform

CAS 71-55-6

CH_3CCl_3

RTECS KJ2975000

Synonyms & Trade Names
Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

DOT ID & Guide
2831 160

Exposure Limits
NIOSH REL: C 350 ppm (1900 mg/m^3) [15-minute] See Appendix C (Chloroethanes)
OSHA PEL†: TWA 350 ppm (1900 mg/m^3)

IDLH 700 ppm See: 71556

Conversion 1 ppm = 5.46 mg/m^3

Physical Description
Colorless liquid with a mild, chloroform-like odor.

MW: 133.4	BP: 165°F	FRZ: -23°F	Sol: 0.4%
VP: 100 mmHg	IP: 11.00 eV		Sp.Gr: 1.34
Fl.P: ?	UEL: 12.5%	LEL: 7.5%	

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities
Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]

Measurement Methods
NIOSH 1003
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA
Up to 700 ppm:
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage

Target Organs Eyes, skin, central nervous system, cardiovascular system, liver

See also: INTRODUCTION See ICSC CARD: 0079 See MEDICAL TESTS: 0141

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September 2005

NIOSH Pocket Guide to Chemical Hazards

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Portland cement

CAS 65997-15-1

RTECS VV8770000

Synonyms & Trade Names
Cement, Hydraulic cement, Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]

DOT ID & Guide

Exposure Limits

NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)

OSHA PEL†: TWA 50 mppcf
See Appendix C (Mineral Dusts)

IDLH 5000 mg/m^3 See: 65997151

Conversion

Physical Description
Gray, odorless powder.

MW: ?	BP: NA	MLT: NA	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Solid

Incompatibilities & Reactivities
None reported

Measurement Methods
NIOSH 0500; OSHA ID207
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Fresh air
Swallow: Medical attention immediately

Respirator Recommendations NIOSH

Up to 50 mg/m^3:
(APF = 5) Any quarter-mask respirator. Click here for information on selection of N, R, or P filters.

Up to 100 mg/m^3:
(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. Click here for information on selection of N, R, or P filters.
(APF = 10) Any supplied-air respirator

Up to 250 mg/m^3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 500 mg/m^3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters.
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 5000 mg/m^3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-

pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: INTRODUCTION See ICSC CARD: 1425 See MEDICAL TESTS: 0196

September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Methyl alcohol

CAS 67-56-1

CH_3OH

RTECS PC1400000

Synonyms & Trade Names
Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit

DOT ID & Guide
1230 131

Exposure Limits

NIOSH REL: TWA 200 ppm (260 mg/m^3) ST 250 ppm (325 mg/m^3) [skin]

OSHA PEL†: TWA 200 ppm (260 mg/m^3)

IDLH 6000 ppm See: 67561

Conversion 1 ppm = 1.31 mg/m^3

Physical Description
Colorless liquid with a characteristic pungent odor.

MW: 32.1	BP: 147°F	FRZ: -144°F	Sol: Miscible
VP: 96 mmHg	IP: 10.84 eV		Sp.Gr: 0.79
Fl.P: 52°F	UEL: 36%	LEL: 6.0%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers

Measurement Methods
NIOSH 2000, 3800; OSHA 91
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Water flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA
Up to 2000 ppm:
(APF = 10) Any supplied-air respirator
Up to 5000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
Up to 6000 ppm:
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract

See also: INTRODUCTION See ICSC CARD: 0057 See MEDICAL TESTS: 0137

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type: Neoprene or rubber gloves.

Respiratory/Type: If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type: Safety glasses with side-shields.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

MATERIAL SAFETY DATA SHEET

Emergency Assistance
Chem-Tel 1-800-255-3924

Manufactured & Distributed By:
Pro Chem Cleaning Systems
609 112th Street
Arlington, Texas 76011

(817) 652-2868
Metro (817) 695-1660

Product Name: **Orange Solve**

PN # D148
UN # None

Date Issued: March 1, 2002
By: Marty Davis
Supersedes: March 28, 1997 and August 9, 1996
Hazard Rating: (Manufacturer)
Health: 1
Fire: 0
Reactivity: 0
Personal Protection: B

Hazard Rating Scale:
0 = Minimal
1 = Slight
2 = Moderate
3 = Serious
4 = Severe

Composition Ingredients

		Exposure Limits, Mg/M3		
		OSHA	ACGIH	OTHER
Component	CAS NO.	PEL	TLV	LIMIT
Terpene Hydrocarbons	5989-27-5	Not Established		
2-Butoxyethoxy	112-34-5	Not Established		
Coupling Agents	N/A	Not Established		

Physical Properties

Boiling Point, Deg. F:
Not Determined
Melting Point, Deg. F:
Not Determined
Specific Gravity (Water=1):
Not Determined
Appearance and Odor:
Yellow/Orange liquid with citrus odor.
Evaporation Rate (Butyl Acetate=1):
Not Determined

Vapor Pressure, MM HG/20 Deg. C:
No Data Found
Vapor Density (Air-1):
No Data Found
Water Solubility %:
Completely Soluble

MATERIAL SAFETY DATA SHEET

Emergency Assistance
Chem-Tel 1-800-255-3924

Manufactured & Distributed By:
Pro Chem Cleaning Systems
609 112th Street
Arlington, Texas 76011

(817) 652-2868
Metro (817) 695-1660

Product Name: **Orange Solve**

PN # D148
UN # None

First Aid Measures

If Inhaled: Remove to fresh air. If breathing is difficult, have a trained person administer oxygen. If respiration stops, give mouth-to-mouth respiration. GET MEDICAL ATTENTION.

In case of eye contact: Immediately flush eyes with water and continue washing for at least 15 minutes lifting upper and lower eyelids occasionally. If irritation persists seek medical attention.

In case of skin contact: Immediately flood skin with lots of running water for at least 15 minutes. Remove contaminated clothing and launder before wearing. Wash skin with mild soap and water. If irritation persists seek medical attention.

If swallowed: Never give anything by mouth to an unconscious person. Do not induce vomiting. Seek medical attention.

Toxicity

Oral: May cause sever irritation and possible tissue damage to mucous membranes of the mouth, throat, esophagus and stomach.

Dermal: Contact may cause discomfort and local redness. Prolonged contact may cause sever irritation.

Inhalation: Exposure to mist, dust or spray may cause coughing, sneezing, or other symptoms of upper respiratory tract irritation.

Carcinogencity: No data available.

Other Data: None.

Fire and Explosion Information

Flash Point, Deg. F:
Does not support flame.
Method Used: N/A

Flammable Limits in Air, %:
Lower: Not Determined.
Upper: Not Determined.

Fire and Explosion Information (Con't.)

Extinguishing Media: Apply water spray (fog), alcohol-type or all-purpose type foams by manufacturer's recommended techniques for large fires. Use CO2 or dry chemical media for small fires.

Special Fire Fighting Procedures: Do not direct a solid stream of water or foam into hot burning pools: this may cause frothing and increase fire intensity. Use self-contained breathing apparatus and protective clothing.

Unusual Fire and Explosion Hazards: None determined.

Hazardous Reactivity

Stability: Under normal conditions this product is stable.

Polymerization: Will not occur.

Conditions to Avoid: Strong oxidizing materials and acids.

Hazardous Decomposition Products: Not determined.

Spill, Leak and Disposal Procedures

Action to take for spills or leaks: Wear eye and skin protection. Floor may be slippery: use care to avoid falling. Wear slicker suit and complete protective equipment including rubber gloves, rubber boots, and a self contained breathing apparatus in the pressure demand mode. Always wear eye protection. For small spills, wipe or mop up and dispose of in DOT approved waste containers. For large spills, contain spills immediately with inert materials, (sand, earth or vermiculite). Keep out of storm drains, and surface waters and soil.

Disposal Methods: Dispose of in accordance with all applicable federal, state and local regulations.

MATERIAL SAFETY DATA SHEET
Emergency Assistance
Chem-Tel 1-800-255-3924

Manufactured & Distributed By:
Pro Chem Cleaning Systems (817) 652-2868
609 112th Street Metro (817) 695-1660
Arlington, Texas 76011

Product Name: **Orange Solve** PN # D148
UN # None

Special Precautions

Storage and Handling Precautions: Store in a cool, dry place. Use safety glasses and synthetic gloves.

When Not In Use: Keep container closed and out of reach of children.

For Additional Information

Contact your local sales representative.

Notice

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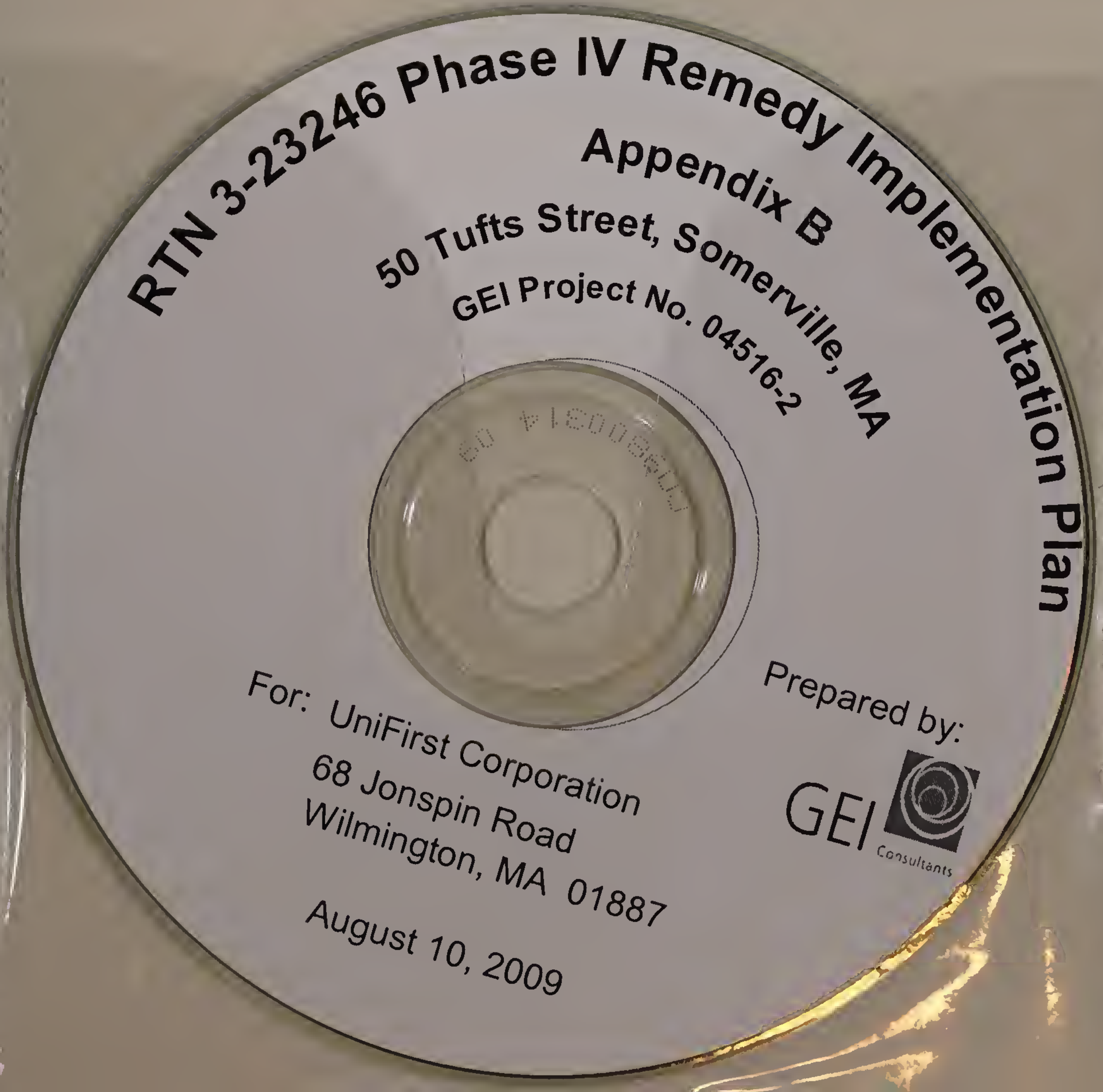
**** END OF MSDS ****



RTN 3-23246 Phase IV Remedy Implementation Plan

Appendix B

50 Tufts Street, Somerville, MA

GEI Project No. 04516-2

Prepared by:

GEI Consultants

For: UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887

August 10, 2009

ww.geiconsultants

Geotechnical
Environmental
Water Resources
Ecological